Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Winston H. Hickox
Agency Secretary

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MEMORANDUM

TO: John Sanders, Chief
Environmental Monitoring and Pest
Management Branch
Department of Pesticide Regulation

FROM: George Lew, Chief
Engineering and Certification Branch
Monitoring and Laboratory Division

DATE: October 15, 2001

SUBJECT: FINAL REPORT FOR THE 1999 CYCLOATE AIR MONITORING

Attached is the final, "Report for the Application and Ambient Air Monitoring for Cycloate." Also attached is the separate volume of appendices for the report. We received your comments (March 7, 2001, Sanders to Lew) on the draft cycloate report (December 4, 2000, Lew to Sanders) and have made a number of corrections and changes you recommended.

If you or your staff have questions or need further information, please contact Kevin Mongar at (916) 322-2449.

Attachment/Separate Appendices

cc: Randy Segawa, DPR (w/Attachment/Appendices)
Sharon Lee, DHS (w/Attachment)
George Alexeeff, Ph.D., OEHHA (w/Attachment)
Stephen L. Birdsall, Imperial County Agricultural Commissioner (APCO)
(w/Attachment)

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

Report for the Application and Ambient Air Monitoring for Cycloate

Testing Section
Engineering and Certification Branch
Monitoring and Laboratory Division

Project No. C99-084 (Ambient)
C99-084a (Application)

Date: October 15, 2001

Approved:

Kevin Mongar, Project Lead

George Lew, Chief
Engineering and Certification Branch

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Summary

Report for the Application and Ambient Air Monitoring for Cycloate

This report presents the results of application and ambient air monitoring for cycloate. Application monitoring was conducted in Imperial County around the use of cycloate as an herbicide on 67 acres of sugar beets from October 5 to 10, 1999. Ambient monitoring was conducted to coincide with the use of cycloate on sugar beets in Imperial County from September 2 to October 15, 1999. Tables 4 and 7 present the results of application and ambient air monitoring for cycloate, respectively. Summaries of the application and ambient results are presented as Tables 5 and 8 respectively. The application sample results have also been summarized as associated with sampling period wind roses in Figures 4 through 12. Laboratory results, in units of ng/sample, equal to or above the estimated quantitation limit (EQL) of 63.0 ng/sample are reported to 3 significant figures. Results equal to or above the method detection limit (MDL) of 12.6 ng/sample but below the EQL are reported as detected (Det). Air concentration results (in units of ng/m^3 and pptv) are reported to 2 significant figures. The air concentration, expressed in units of ng/m^3 (or pptv), associated with the EQL is dependent on the volume of air sampled which varies from sample to sample. For a 24-hour sampling period at 3 Lpm the air concentration would be 15 ng/m^3 (1.7 pptv) for cycloate as associated with the EQL.

All of the four application background samples had results of "<MDL". Of the sixty-four application samples collected (spikes, blanks, collocated and background samples excluded) ten were found to be above the EQL for cycloate, twenty-four sample results were "detected", twenty-nine sample results were <MDL and one sample (S16) was invalidated due to a sampling problem. The highest cycloate concentration, 500 ng/m^3 (56 pptv), was observed at the S2 (south-2) sampling site during the 3rd sampling period (2^{nd} application).

Of the one-hundred-fifteen ambient samples collected (spikes, blanks and collocated samples excluded), twenty-seven were found to be above the EQL for cycloate, forty-five were found to have results of "detected" and the remaining forty-three were below the MDL. The highest cycloate concentration, 220 ng/m^3 (25 pptv), was observed at the Heber Fire Department (HFD) sampling site on September 22, 1999.

Acknowledgments

Oscar Lopez and Neil Adler of the ARB Testing Section conducted the application study. Tony Royer of the ARB Air Quality Surveillance Branch collected the ambient samples. Assistance was provided by the Imperial County Agricultural Commissioner's Office. Bob Okamoto of the Evaluation Section Laboratory performed method development and chemical analyses. Neil Adler of the Testing Section prepared the sampling tree and application site diagrams presented in this report.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES
(contained in a separate volume)

Report for the Application
and Ambient Air Monitoring for Cycloate

I. Introduction

At the request of the California Department of Pesticide Regulation (DPR) (September 2, 1998 memorandum, Okumura to Lew), the Air Resources Board (ARB) staff determined airborne concentrations of the pesticide cycloate. Application monitoring was conducted in Imperial County around the use of cycloate as an herbicide on 67 acres of sugar beets from October 5 to 10, 1999. Ambient monitoring was conducted to coincide with the use of cycloate on sugar beets in Imperial County from September 2 to October 15, 1999. This monitoring was done to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) which requires the ARB "to document the level of airborne emissions .... of pesticides which may be determined to pose a present or potential hazard..." when requested by the DPR. The ARB Evaluation Section Laboratory conducted the method development and sample analyses. Testing Section staff conducted site selection for the application and ambient studies and sample collection for the application study. Air Quality Surveillance staff conducted sample collection for the ambient study.

The protocol for the application and ambient air monitoring for cycloate is enclosed separately as Appendix I (page 1 of a separate volume of appendices to this report).

The laboratory report, "Cycloate Method Development and Cycloate Analytical Results for Ambient Monitoring and Application Samples", is enclosed separately as Appendix II (page 8 of the separate volume of appendices to this report). The sampling/analysis Standard Operating Procedures (SOP) are also enclosed in Appendix II (page 34 of the separate volume of appendices to this report).

The pesticide use report for the application study is enclosed separately as Appendix III (page 41 of the separate volume of appendices to this report).

The DPR's September 2, 1998 memorandum, "Use Information and Air Monitoring Recommendation for the Pesticide Active Ingredient Cycloate" is enclosed separately as Appendix IV (page 42 of the separate volume of appendices to this report).

The application and ambient field log sheets are enclosed separately as Appendix V (page 58 of the separate volume of appendices to this report).

The application meteorological monitoring results are enclosed separately as Appendix VI (page 70 of the separate volume of appendices to this report).

II. Chemical Properties of Cycloate

The following information regarding the chemical properties of cycloate was obtained from the DPR's September 2, 1998 memorandum, "Use Information and Air Monitoring Recommendation for the Pesticide Active Ingredient Cycloate" (page 42 of appendices).

Pure cycloate (CAS:1134-23-2) exists as colorless liquid with an aromatic odor. Cycloate has a molecular formula of $C_{11}H_{21}NOS$ and a molecular weight of 215.37 g/mole. It has a water solubility of 9.5×10^{1} mg/L at 25 °C, a Henry's Constant of 4.76×10^{-6} atm·m^3/mol at 25 °C, and a vapor pressure of approximately 1.60×10^{-3} mm Hg at 25 °C.

Soil-applied cycloate volatilizes readily from moist soil when it is applied to the soil's surface without incorporation. Volatilization does not play a large role in cycloate's loss from dry soils. Microbial breakdown plays a major role in cycloate's disappearance from soils, when cycloate is incorporated to a depth of two to three inches. Cycloate resists leaching in heavy clay and highly organic soils; however, in loamy sand it leached downward three to six inches with application of eight inches of water. Under crop growing conditions, cycloate's reported half-life ranged from four to eight weeks in several soils.

In plants, cycloate is readily taken up by sugarbeet roots and translocated to the stems and leaves. Although not applied to foliar surfaces, cycloate is rapidly absorbed by leaves. Cycloate does not persist in plants. Within three days after treatment, cycloate is rapidly and completely metabolized in sugarbeet roots and foliage to ethyl-cyclohexlamine, carbon dioxide, amino acids, sugars, and other natural plant constituents.

The acute oral LD_{50} of cycloate is 2,000-3190 mg/kg and 3,160-4,100 mg/Kg for male and female rats, respectively. The LC_{50} (96 hour) for rainbow trout is 4.5 mg/L and 10 ppm for mosquito fish. Cycloate entered the risk assessment process at DPR under the Birth Defect Prevention Act of 1984 based on its toxicity in animal studies. Damage to the nervous system was the major concern, however cycloate also demonstrated chronic toxicity, oncogenicity and reproductive toxicity.

III. Sampling

A sketch of the sampling apparatus is shown in Figure 3. Samples were collected by passing a measured volume of ambient air through XAD-2 resin. The XAD-2 resin tubes were obtained from SKC (#226-30-06). Rotameters were used to control sample flow rates. The rotameters were adjusted to the correct flow (3 Lpm) before each 24-hour sampling period and checked at the end of each sampling period using a calibrated digital mass flow meter. The sampling system operated continuously with the exact operating interval noted. Samplers were leak checked before and after each

sampling period with the sampling cartridges installed. Any change in the flow rates was recorded in the field log book (see appendices pg. 58). The resin tubes were protected from direct sunlight and supported about 1.5 meters above the ground (or roof) during the sampling period. At the end of each sampling period the tubes were capped and placed in culture tubes with an identification label affixed. The field log book was used to record start and stop times, sample identifications, start and stop flow rates and any other significant comments. Subsequent to sampling, the samples were shipped or transported on dry ice, as soon as reasonably possible, to the Evaluation Section Laboratory in Sacramento. The samples were then stored in the freezer until extraction and analysis. A chain of custody sheet accompanied all samples.

A. Application Monitoring

The DPR's monitoring recommendation suggested that application-site air monitoring should be conducted in Imperial County during the same months as the ambient study, in association with cycloate use on sugar beets at the highest rates of use; i.e., about 4.0 pounds per acre.

A 67 acre sugar beet field (actually 2 adjacent plots) was chosen for the application monitoring site. Refer to Figure 2 for a diagram of the application site. Refer to Appendix III (page 41 of appendices) for a copy of the pesticide use report. Note that the use report stated that the "acres applied" was 70.00. However, the measured application area was 67 acres.

Information collected regarding the application included: 1) the elevation of each sampling station with respect to the field, 2) the orientation of the field with respect to North (identified as either geographic or magnetic), 3) an accurate record of the positions of the monitoring equipment with respect to the field, including the distance each monitor is positioned away from the edge of the field and an accurate drawing of the monitoring site showing the precise location of the monitoring equipment and any wind obstacles with respect to the field, 4) the field size, 5) the application rate, 6) formulation and 7) method and length of application. Details regarding the site and application are summarized below in Table 1.

Table 1.
Application Information

Range/Township/Section:	R:15/T:16/S:29
Product Applied:	RO-NEET 6-E (6 lbs. A.I. per gallon)
Type of Application:	Ground spray, mulch and incorporation in 24 " bands
Application Rate:	30 gallons product in 1400 gal. water per 70 acres (2.58 lbs. cycloate A.I. per acre)
Grower/Applicator:	Tony Abatti/Mike Mannix

A three day monitoring period was recommended in the DPR's November 4, 1998 memorandum with intended sampling times as follows: (where the first sample is started at the start of application) during application, followed by a 1-hour sample, a 2-hour sample, a 3-hour sample (or up to 1 hour before sunset), a 6-hour sample (or up to 1 hour before sunset), overnight (until 1 hour after sunrise), daytime (until 1 hour before sunset), overnight (until 1 hour after sunrise) and 24 hour (until 1 hour after sunrise).

Background samples were taken at each position to establish if any cycloate was detectable in the air before the application (i.e., from nearby applications). The background samples were collected from 1530 to 0620, October 5 to 6, 1999 (14 3/4 hours). The application started at 0735 on October 6, 1999 and was stopped due to tiller breakdown at 0755. The application was restarted at 1145 and ended for the day

up to determine wind speed and direction, air temperature, barometric pressure and relative humidity. The raw meteorological station data is available on a 1.44 MB diskette (comma delimited text format). Appendix VI (page 111 of the appendices) lists the meteorological station data in 15-minute averages for the test period. ARB staff noted the degree of cloud cover, on the sample log sheet, whenever sample cartridges were changed. The sky conditions were clear during the study period.

B. Ambient Monitoring

Ambient monitoring was conducted to coincide with the use of cycloate on sugar beets in Imperial County for six weeks from September 2 to October 15, 1999. Four sampling sites were selected by ARB personnel from the areas of Imperial County where sugar beet farming occurs and in populated areas or in areas frequented by people. Sites were selected with considerations for both accessibility and security of the sampling equipment. Urban background samples were collected at the Imperial County Air Pollution Control District office in El Centro. The five sites are presented in Figure 1 and listed in Table 3. Twenty-four hour (approximately) samples were taken Monday through Friday (4 samples/week) at a flow rate of 3 Lpm. Twenty-three discreet sampling days were monitored at each site for a total of 115 samples (plus 30 collocated samples, 4 trip blanks and 8 quality assurance spikes) were collected.

Table 3.
Ambient Sampling Sites

MES	Mulberry Elementary School 1391 Rutherford Road Brawley, CA 92227 Range/Township/Section: R.15E/T.13S/S.10	(760) 344-8600 Sue Hess Superintendent
WES	Westmorland Elementary School 1000 Elk Hills Drive Westmorland, CA 95632 Range/Township/Section: R.13E/T.13S/S.10	(760) 344-4364 Linda Morse Principal
ELC	Imperial County APCD Office 150 S. 9th Street El Centro, CA 92243 Range/Township/Section: R.13E/T.15S/S.6-NW1/4	(760) 339-4606 Brad Poiriez Dep Air Poll. Contr. Officer
HFD	Heber Fire District 1085 Ingram Avenue Heber, CA 92249 Range/Township/Section: R.13E/T.16S/S.27-SW1/4	(760) 355-1191 Assist. Chief Nippins

CLX	ARB Air Monitoring Station 1029 Ethel Calexico, CA 92231 Range/Township/Section: R.14E/T.16 1/2S/S.14-NE1/4	(760) 575-6856 Curt Schreiber (Background site)

The Mulberry Elementary School is located in an agricultural area northeast of Brawley. There were agricultural fields directly adjacent (e.g., 50 yards) the school on all sides. The sampling unit was placed on the roof of a one-story building at a height of approximately 12 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 16 feet above the ground.

The Westmorland Elementary School is located in a residential/agricultural area of the small town of Westmoreland. There were agricultural fields approximately 200 yards to the south and east and approximately 1 mile to the north and west of the school. The sampling unit was placed on the roof of a one-story building at a height of approximately 18 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 22 feet above the ground.

The urban background monitoring was done at the Imperial County APCD office, located in a business/residential area of El Centro. There is no agriculture in the immediate area around the site. The sampling unit was placed on the roof of the three-story building at a height of approximately 30 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 34 feet above the ground.

The Imperial County Fire Department, Heber Fire District is located in the small town of Heber. There are agricultural fields approximately 200 yards to the south, 300 yards to the west and 1 mile to the north and east. The sampling unit was placed on the roof of the one story building at a height of approximately 13 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 17 feet above the ground.

The ARB Ambient Monitoring Station is located on the east side of Calexico. The nearest agriculture is appproximately 2 miles to the north or east. The sampling unit was placed on the roof of the one story trailer at a height of approximately 12 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 16 feet above the ground.

IV. Analytical Methodology

The "Standard Operating Procedures for Sampling and Analysis of Cycloate in Ambient Air" are enclosed in Appendix III (page 34 of appendices). The procedures specify that

the exposed XAD-2 resin tubes are stored in an ice chest on dry ice or in a freezer until desorbed with 3 mL of 50:50 ethyl acetate/acetone. An aliquot of the extract is spiked with 30 ng of atrazine-$^{13}C_3$ prior to extraction. The splitless injection volume is 1 uL. A gas chromatograph with a DB-5MS capillary column and a quadrapole mass spectrometer (MS) is used for analysis. The MS detector is operated in selected ion monitoring mode.

V. Application and Ambient Results

Tables 4 and 7 present the results of application and ambient air monitoring, respectively, for cycloate. Summaries of the application and ambient results are presented in Tables 5 and 8 respectively.

The Evaluation Section Laboratory determined the analytical MDL as (3.14)(s); where s is the standard deviation calculated for the results of seven replicate resin spikes (near the estimated detection limit). The MDL was 12.6 ng/sample for cycloate. The estimated quantitation limit (EQL), calculated as 5 times the MDL, was 63.0 ng/sample for cycloate. Results equal to or above the MDL but below the EQL are reported as detected (Det). Laboratory results, in units of ng/sample, equal to or above the EQL are reported to 3 significant figures. Air concentration results (in units of ng/m^3 and pptv) are reported to 2 significant figures. The air concentration, expressed in units of ng/m^3 (or pptv), associated with the EQL is dependent on the volume of air sampled which varies from sample to sample. For a 24-hour sampling period at 3 Lpm the air concentration would be 15 ng/m^3 (1.7 pptv) as associated with the EQL for cycloate.

The equation used to convert cycloate air concentration from units of ng/m^3 to pptv units at 1 atmosphere and 25 °C is shown below.

$$\text{pptv} = (\text{ng/m}^3) \times \frac{(0.0820575 \text{ liter-atm/mole-°K})(298\text{°K})}{(1 \text{ atm})(215.4 \text{ gram/mole})} = (0.1135) \times (\text{ng/m}^3)$$

A. Application Monitoring Results

The application sample results have also been summarized as associated with sampling period wind roses in Figures 4 through 12. The spokes of the wind roses correspond to the compass direction of origin of the wind. For example, the breezes were predominantly from the west during the background-sampling period. The segments of each spoke correspond to incremental increases in wind speed (knots), as illustrated by the legends. The length of the spoke (and each segment) corresponds to the portion of the sampling time that the wind was from that direction (at that speed).

All of the four application background samples had results of "<MDL". Of the sixty-four application samples collected (spikes, blanks, collocated and background samples excluded) ten were found to be above the EQL for cycloate, twenty-four sample results

were "detected", twenty-nine sample results were <MDL and one sample (S16) was invalidated due to a sampling problem. The highest cycloate concentration, 500 ng/m^3 (56 pptv), was observed at the S2 sampling site during the 3rd sampling period (2nd application).

B. Ambient Monitoring Results

Of the one-hundred-fifteen ambient samples collected (spikes, blanks and collocated samples excluded), twenty-seven were found to be above the EQL for cycloate, forty-five were found to have results of "detected" and the remaining forty-three were below the MDL. The highest cycloate concentration, 220 ng/m^3 (25 pptv), was observed at the Heber Fire Department (HFD) sampling site on September 22, 1999.

VI. Quality Assurance

Field quality control (QC) for the application monitoring included the following:

1) Four field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling) prepared by the Evaluation Section staff. The field spikes were obtained by sampling ambient air at 3 Lpm for the same duration as the background samples (i.e, collocated with a background sample);
2) four trip spikes;
3) replicate samples (collocated) collected at one of the four sampling sites;
4) a trip blank; and
5) four background samples collected before the application.

Field QC for the ambient monitoring included the following:

1) Four field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling) prepared by the Evaluation Section staff; the field spikes were obtained by sampling ambient air at the background monitoring site for 24 hour periods at 3 Lpm (collocated with an ambient sample);
2) four trip spikes;
3) replicate (collocated) samples taken for six dates at each sampling location; and
4) four trip blanks;

Rotameters were used to control the sampling flow rate. The flow rates were set at the start of every sampling period (every sample) using a calibrated digital mass flow meter (battery operated). The flow rates were also checked and recorded at the end of each sampling period using the mass flow meter. The ARB Standards Laboratory calibrated the mass flow meter.

The laboratory instrument dependent parameters (reproducibility, linearity and EQL) are discussed in the SOP (page 77 of the appendices).

VII. Quality Assurance Results

A. Method Development

Refer to Appendix II (page 8 of the appendices) for discussion and results of method development studies. The freezer storage stability study results (pg. 39 of appendices) show that cycloate is stable for at least 8 weeks. All of the ambient and application samples were analyzed within 25 days of reciept.

B. Trip Blanks

The application trip blank and the 4 ambient trip blanks had results of <MDL for cycloate.

C. Application Background Sample Results

All four of the application background samples had results of <MDL.

D. Collocated Sample Results

Referring to Table 6, two collocated pairs of samples for the application study had both results above the EQL. The relative differences (100 x difference/average) of the data pairs ranged were both 0%.

Referring to Table 9, six of the ambient collocated pairs had both results above the EQL. The relative differences (100 x difference/average) ranged from 1% to 32%.

E. Laboratory, Trip and Field Spikes

Laboratory, trip and field spikes are all prepared at the same time and at the same level. The spikes are prepared in replicate sets of four (4) to allow statistics to be applied if necessary to evaluate differences in the results of the three sets. The laboratory spikes are placed immediately in a freezer and kept there until extraction and analysis. The trip spikes are kept in a freezer until transported to the field. The trip spike samples are kept on dry ice in an ice chest (the same one used for samples) during transport to and from the field and at all times while in the field except for trip spike sample log-in and labeling. The field spikes are kept in a freezer until transported to the field. The field spike samples are kept on dry ice in an ice chest (the same one used for samples) during transport to and from the field and at all times while in the field except for the sampling period. Field spikes were collected at the same environmental and experimental conditions as those occurring at the time of ambient sampling. The field

spikes were obtained by sampling ambient air through the previously spiked cartridges and are collocated with an ambient. The extraction and analysis of laboratory, trip and field spikes normally occurs at the same time. Laboratory, trip and field spikes for the application and ambient studies were prepared by Evaluation Section staff.

1) Laboratory Spikes: The laboratory spike results for the application study are listed in Table 10. Each of the spike cartridges was spiked with 600 ng of cycloate. The average recovery for cycloate for the application lab spikes was 104%. The laboratory spike results for the ambient study are listed in Table 13. Each of the spike cartridges was spiked with 300 ng of cycloate. The average recovery for cycloate for the ambient lab spikes was 91%.

2) Trip Spikes: The trip spike results for the application and ambient studies are listed in Tables 11 and 14 respectively. Each of the cartridges was spiked with 600 and 300 ng of cycloate for the application and ambient studies respectively. The average recoveries for cycloate for the application trip spikes was 96% and for the ambient trip spikes was 93%. These results are consistent with the lab spike results and indicate that the sample transport, storage and analytical procedures used in this study produce acceptable results for cycloate.

3) Field Spikes: The field spike results for the application and ambient studies are listed in Tables 12 and 15 respectively. Each of the cartridges was spiked with with 600 and 300 ng of cycloate for the application and ambient studies respectively. The average recovery for cycloate for the application field spikes was 87% and for the ambient field spikes was 58%. The application results are consistent with the lab and trip spike results and indicate that the sampling, sample transport, storage and analytical procedures used in this study produce acceptable results for cycloate. The ambient field spike results, however, indicate low recovery for cycloate. The outside temperatures in Imperial County during the ambient study were very hot, e.g., 110 °F to 120 °F during the day. Sample breakthrough was possible but the analysis of the backup resin bed in four ambient samples containing cycloate indicated no breakthrough. It is possible that chemical degradation of cycloate may have occurred. Note that the regular ambient sample collocated with the field spikes had a result of detected for cycloate. The cycloate recoveries were adjusted for this background level by subtracting 37.8 ng ((MDL+EQL)/2) from the spiked sample results.

FIGURE 1
Cycloate Ambient Monitoring Area
(map provided by DPR)

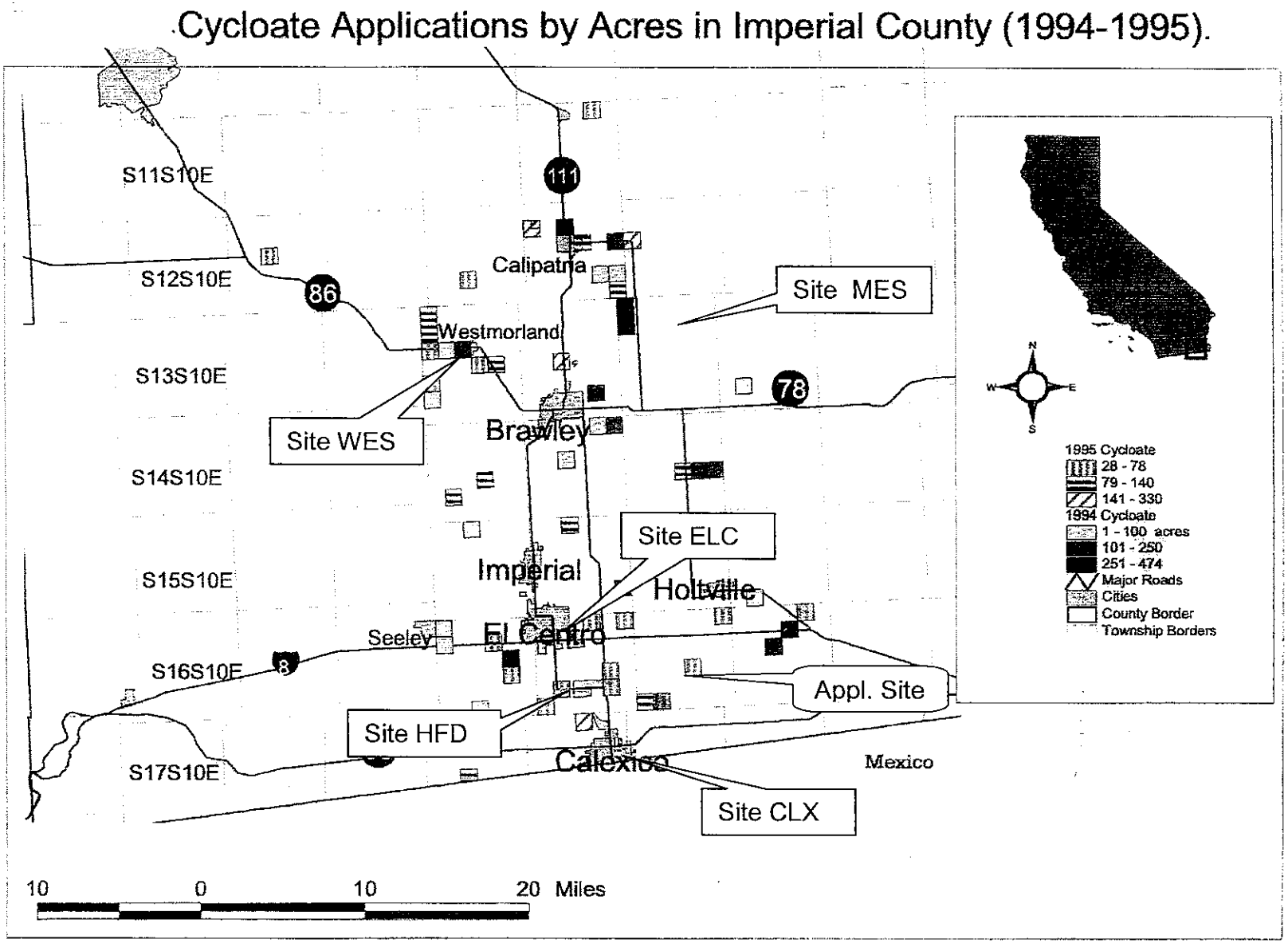


FIGURE 2
Cycloate Application Site

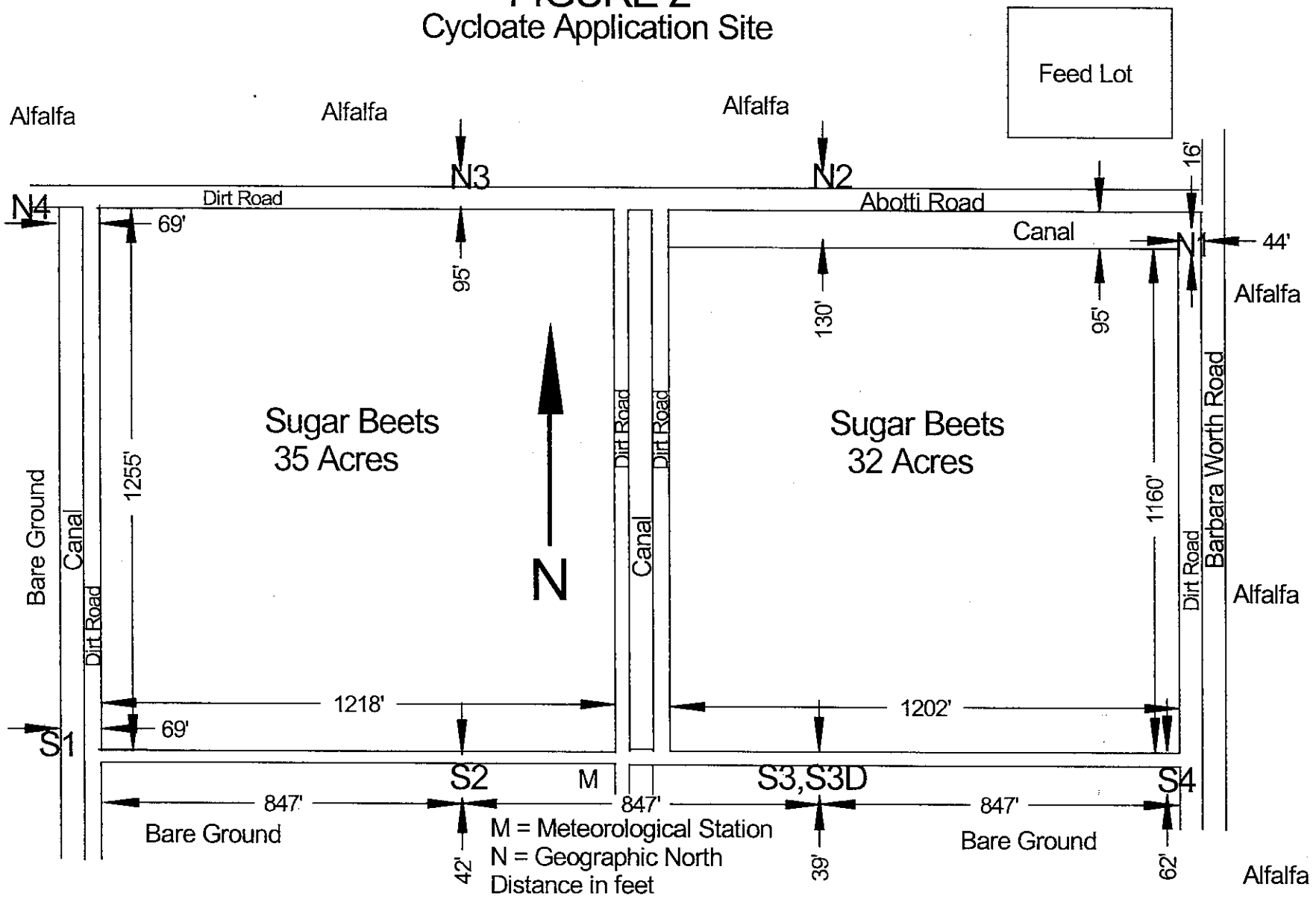


FIGURE 3.
Sample Tree

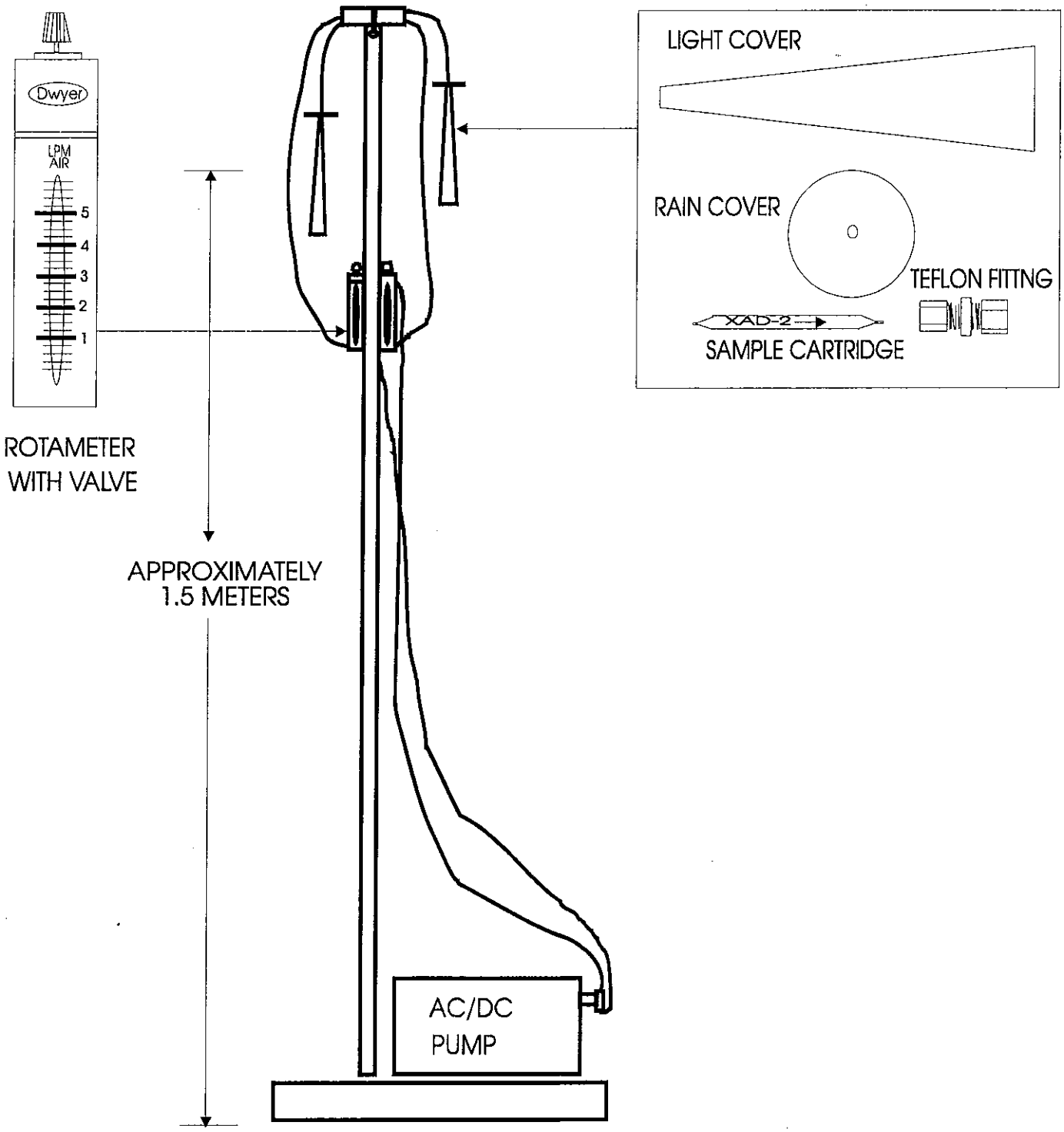


Table 4. Cycloate Application Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
1	N2B	10/05/99 1530	10/06/99 0620	890	14.8	2.67	<MDL	<MDL	<MDL
3	N3B	10/05/99 1540	10/06/99 0630	890	14.8	2.67	<MDL	<MDL	<MDL
5	S2B	10/05/99 1600	10/06/99 0645	885	14.8	2.66	<MDL	<MDL	<MDL
7	S3B	10/05/99 1605	10/06/99 0650	885	14.7	2.65	<MDL	<MDL	<MDL
9	N11	10/06/99 0620	10/06/99 1640	390	6.5	1.17	6.95E+1	5.9E+01	6.7E+00
10	N21	10/06/99 0630	10/06/99 1645	385	6.4	1.16	<MDL	<MDL	<MDL
11	N31	10/06/99 0635	10/06/99 1650	385	6.4	1.16	<MDL	<MDL	<MDL
12	N41	10/06/99 0640	10/06/99 1655	385	6.4	1.16	<MDL	<MDL	<MDL
13	S11	10/06/99 0645	10/06/99 1700	385	6.4	1.16	<MDL	<MDL	<MDL
14	S21	10/06/99 0648	10/06/99 1705	385	6.4	1.16	<MDL	<MDL	<MDL
15	S31	10/06/99 0650	10/06/99 1707	390	6.5	1.09	<MDL	<MDL	<MDL
16	S31D	10/06/99 0650	10/06/99 1707	390	6.5	1.01	<MDL	<MDL	<MDL
17	S41	10/06/99 0655	10/06/99 1710	385	6.4	1.16	<MDL	<MDL	<MDL
18	N12	10/06/99 1640	10/07/99 0650	850	14.2	2.55	Det	Det	Det
19	N22	10/06/99 1645	10/07/99 0655	850	14.2	2.55	<MDL	<MDL	<MDL
20	N32	10/06/99 1650	10/07/99 0700	850	14.2	2.55	<MDL	<MDL	<MDL
21	N42	10/06/99 1655	10/07/99 0705	850	14.2	2.55	<MDL	<MDL	<MDL
22	S12	10/06/99 1700	10/07/99 0707	847	14.1	2.54	<MDL	<MDL	<MDL
23	S22	10/06/99 1705	10/07/99 0710	845	14.1	2.53	<MDL	<MDL	<MDL
24	S32	10/06/99 1707	10/07/99 0712	845	14.1	2.54	Det	Det	Det
25	S32D	10/06/99 1707	10/07/99 0712	845	14.1	2.54	Det	Det	Det
26	S42	10/06/99 1710	10/07/99 0715	845	14.1	2.53	6.74E+1	2.7E+01	3.0E+00
27	N13	10/07/99 0650	10/07/99 1657	607	10.1	1.82	<MDL	<MDL	<MDL
28	N23	10/07/99 0655	10/07/99 1700	605	10.1	1.82	<MDL	<MDL	<MDL
29	N33	10/07/99 0700	10/07/99 1703	603	10.1	1.81	<MDL	<MDL	<MDL
30	N43	10/07/99 0705	10/07/99 1705	600	10.0	1.80	<MDL	<MDL	<MDL

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 4. Cycloate Application Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
31	S13	10/07/99 0707	10/07/99 1710	603	10.1	1.81	<MDL	<MDL	<MDL
32	S23	10/07/99 0710	10/07/99 1712	602	10.0	1.81	8.95E+2	5.0E+02	5.6E+01
33	S33	10/07/99 0712	10/07/99 1715	603	10.0	1.81	5.20E+2	2.9E+02	3.3E+01
34	S33D	10/07/99 0712	10/07/99 1716	604	10.1	1.81	5.19E+2	2.9E+02	3.3E+01
35	S43	10/07/99 0715	10/07/99 1720	605	10.1	1.81	Det	Det	Det
36	N14	10/07/99 1657	10/08/99 0715	858	14.3	2.57	Det	Det	Det
37	N24	10/07/99 1700	10/08/99 0720	860	14.3	2.58	Det	Det	Det
38	N34	10/07/99 1703	10/08/99 0725	862	14.4	2.59	Det	Det	Det
39	N44	10/07/99 1705	10/08/99 0730	865	14.4	2.60	Det	Det	Det
40	S14	10/07/99 1710	10/08/99 0735	865	14.4	2.59	Det	Det	Det
41	S24	10/07/99 1712	10/08/99 0739	867	14.4	2.60	1.20E+2	4.6E+01	5.2E+00
42	S34	10/07/99 1715	10/08/99 0742	867	14.4	2.60	3.84E+2	1.5E+02	1.7E+01
43	S34D	10/07/99 1716	10/08/99 0743	867	14.4	2.60	3.98E+2	1.5E+02	1.7E+01
44	S44	10/07/99 1720	10/08/99 0750	870	14.5	2.61	1.02E+2	3.9E+01	4.4E+00
45	N15	10/08/99 0715	10/08/99 1125	250	4.2	0.80	<MDL	<MDL	<MDL
46	N25	10/08/99 0720	10/08/99 1128	248	4.1	0.74	<MDL	<MDL	<MDL
47	N35	10/08/99 0725	10/08/99 1130	245	4.1	0.73	<MDL	<MDL	<MDL
48	N45	10/08/99 0730	10/08/99 1133	243	4.0	0.73	<MDL	<MDL	<MDL
49	S15	10/08/99 0735	10/08/99 1140	245	4.1	0.74	Det	Det	Det
50	S25	10/08/99 0739	10/08/99 1142	243	4.1	0.73	1.09E+2	1.5E+02	1.7E+01
51	S35	10/08/99 0742	10/08/99 1145	243	4.1	0.73	7.16E+1	9.8E+01	1.1E+01
52	S35D	10/08/99 0743	10/08/99 1147	244	4.1	0.73	Det	Det	Det
53	S45	10/08/99 0750	10/08/99 1150	240	4.0	0.72	7.65E+1	1.1E+02	1.2E+01
54	N16	10/08/99 1125	10/08/99 1739	374	6.2	1.12	<MDL	<MDL	<MDL
55	N26	10/08/99 1128	10/08/99 1745	377	6.3	1.13	<MDL	<MDL	<MDL
56	N36	10/08/99 1130	10/08/99 1749	379	6.3	1.14	Det	Det	Det

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 4. Cycloate Application Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
57	N46	10/08/99 1133	10/08/99 1752	379	6.3	1.14	<MDL	<MDL	<MDL
58	S16	10/08/99 1140	NA	NA	NA	NA	Det	NA	NA
59	S26	10/08/99 1142	10/08/99 1805	383	6.4	1.15	<MDL	<MDL	<MDL
60	S36	10/08/99 1145	10/08/99 1808	383	6.4	1.15	<MDL	<MDL	<MDL
61	S36D	10/08/99 1147	10/08/99 1810	383	6.4	1.15	<MDL	<MDL	<MDL
62	S46	10/08/99 1150	10/08/99 1815	385	6.4	1.15	<MDL	<MDL	<MDL
68	N17	10/08/99 1739	10/09/99 0735	836	13.9	2.51	Det	Det	Det
69	N27	10/08/99 1745	10/09/99 0738	833	13.9	2.50	<MDL	<MDL	<MDL
70	N37	10/08/99 1749	10/09/99 0741	832	13.9	2.50	Det	Det	Det
71	N47	10/08/99 1752	10/09/99 0744	832	13.9	2.50	Det	Det	Det
72	S17	10/08/99 1800	10/09/99 0748	828	13.8	2.48	Det	Det	Det
73	S27	10/08/99 1805	10/09/99 0751	826	13.8	2.48	Det	Det	Det
74	S37	10/08/99 1808	10/09/99 0754	826	13.8	2.48	Det	Det	Det
75	S37D	10/08/99 1810	10/09/99 0755	825	13.7	2.47	Det	Det	Det
76	S47	10/08/99 1815	10/09/99 0800	825	13.8	2.48	Det	Det	Det
77	N18	10/09/99 0735	10/10/99 0726	1431	23.9	4.29	Det	Det	Det
78	N28	10/09/99 0738	10/10/99 0731	1433	23.9	4.30	Det	Det	Det
79	N38	10/09/99 0741	10/10/99 0736	1435	23.9	4.30	<MDL	<MDL	<MDL
80	N48	10/09/99 0744	10/10/99 0739	1435	23.9	4.30	Det	Det	Det
81	S18	10/09/99 0748	10/10/99 0742	1434	23.9	4.30	Det	Det	Det
82	S28	10/09/99 0751	10/10/99 0745	1434	23.9	4.30	Det	Det	Det
83	S38	10/09/99 0754	10/10/99 0750	1436	23.9	4.31	Det	Det	Det
84	S38D	10/09/99 0755	10/10/99 0750	1435	23.9	4.31	Det	Det	Det
85	S48	10/09/99 0800	10/10/99 0755	1435	23.9	4.30	Det	Det	Det

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 5. Summary of Cycloate Application Results (ng/m3)

Sampling Period	Hours Sampled	South1	South2	South3	South3D	South4	North1	North2	North3	North4
Background	14 3/4	NA	<MDL	<MDL	NA	NA	NA	<MDL	<MDL	NA
1	7	<MDL	<MDL	<MDL	<MDL	<MDL	59	<MDL	<MDL	<MDL
2	14 1/4	<MDL	<MDL	Det	Det	27	Det	<MDL	<MDL	<MDL
3	10	<MDL	500	290	290	Det	<MDL	<MDL	<MDL	<MDL
4	14	Det	46	150	150	39	Det	Det	Det	Det
5	4	Det	150	98	Det	110	<MDL	<MDL	<MDL	<MDL
6	6 1/2	Det	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL	Det	<MDL
7	13 3/4	Det	Det	Det	Det	Det	Det	<MDL	Det	Det
8	24	Det	Det	Det	Det	Det	Det	Det	<MDL	Det

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but $\geq$ MDL
NA = Not Applicable

Table 6. Cycloate Application Collocated Results (ng/m3)

Sampling Period	South3	South3D	Average	Relative Difference
Background	<MDL	NA	NA	NA
1	<MDL	<MDL	NA	NA
2	Det	Det	NA	NA
3	290	290	290	0%
4	150	150	150	0%
5	98	Det	NA	NA
6	<MDL	<MDL	NA	NA
7	Det	Det	NA	NA
8	Det	Det	NA	NA

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥ MDL
NA = Not Applicable
Relative Difference = (Difference/Average)100

Table 7. Cycloate Ambient Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
1	MES1	09/02/99 0945	09/03/99 1025	1480	24.7	4.4	<MDL	<MDL	<MDL
2	MES1D	09/02/99 0945	09/03/99 1025	1480	24.7	4.4	<MDL	<MDL	<MDL
3	WES1	09/02/99 1015	09/03/99 1055	1480	24.7	4.4	<MDL	<MDL	<MDL
4	WES1D	09/02/99 1015	09/03/99 1055	1480	24.7	4.4	NA	NA	NA
5	ELC1	09/02/99 1050	09/03/99 1130	1480	24.7	4.4	<MDL	<MDL	<MDL
6	ELC1D	09/02/99 1050	09/03/99 1130	1480	24.7	4.4	<MDL	<MDL	<MDL
7	HFD1	09/02/99 1110	09/03/99 1155	1485	24.8	4.5	<MDL	<MDL	<MDL
8	HFD1D	09/02/99 1110	09/03/99 1155	1485	24.8	4.5	<MDL	<MDL	<MDL
9	CLX1	09/02/99 1140	09/03/99 1230	1490	24.8	4.5	<MDL	<MDL	<MDL
10	CLX1Da	09/02/99 1140	09/03/99 1230	1490	24.8	4.5	<MDL	<MDL	<MDL
11	CLX1Db	09/02/99 1140	09/03/99 1230	1490	24.8	4.5	NA	NA	NA
12	CLX1Dc	09/02/99 1140	09/03/99 1230	1490	24.8	4.5	<MDL	<MDL	<MDL
13	MES2	09/07/99 0830	09/08/99 0830	1440	24.0	4.3	Det	Det	Det
14	WES2	09/07/99 0900	09/08/99 0900	1440	24.0	4.3	<MDL	<MDL	<MDL
15	ELC2	09/07/99 0940	09/08/99 0935	1435	23.9	4.3	<MDL	<MDL	<MDL
16	HFD2	09/07/99 1005	09/08/99 1000	1435	23.9	4.3	<MDL	<MDL	<MDL
17	CLX2	09/07/99 1035	09/08/99 1035	1440	24.0	4.3	<MDL	<MDL	<MDL
18	CLX2D	09/07/99 1035	09/08/99 1035	1440	24.0	4.3	<MDL	<MDL	<MDL
19	MES3	09/08/99 0830	09/09/99 0830	1440	24.0	4.3	<MDL	<MDL	<MDL
20	MES3D	09/08/99 0830	09/09/99 0830	1440	24.0	4.3	<MDL	<MDL	<MDL
21	WES3	09/08/99 0900	09/09/99 0900	1440	24.0	4.3	1.63E+2	3.8E+01	4.3E+00
22	WES3D	09/08/99 0900	09/09/99 0900	1440	24.0	4.3	1.58E+2	3.7E+01	4.2E+00
23	ELC3	09/08/99 0935	09/09/99 0935	1440	24.0	4.3	7.97E+1	1.8E+01	2.1E+00
24	ELC3D	09/08/99 0935	09/09/99 0935	1440	24.0	4.3	8.07E+1	1.9E+01	2.1E+00
25	HFD3	09/08/99 1000	09/09/99 1005	1445	24.1	4.3	<MDL	<MDL	<MDL
26	HFD3D	09/08/99 1000	09/09/99 1005	1445	24.1	4.3	<MDL	<MDL	<MDL
27	CLX3	09/08/99 1035	09/09/99 1040	1445	24.1	4.3	<MDL	<MDL	<MDL

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 7. Cycloate Ambient Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
28	CLX3Da	09/08/99 1035	09/09/99 1040	1445	24.1	4.3	<MDL	<MDL	<MDL
29	CLX3Db	09/08/99 1035	09/09/99 1040	1445	24.1	4.3	<MDL	<MDL	<MDL
30	CLX3Dc	09/08/99 1035	09/09/99 1040	1445	24.1	4.3	<MDL	<MDL	<MDL
31	MES4	09/09/99 0830	09/10/99 0825	1435	23.9	4.3	Det	Det	Det
32	WES4	09/09/99 0855	09/10/99 0850	1435	23.9	4.3	Det	Det	Det
33	ELC4	09/09/99 0930	09/10/99 0925	1435	23.9	4.3	7.17E+1	1.7E+01	1.9E+00
34	HFD4	09/09/99 0950	09/10/99 0940	1430	23.8	4.3	1.75E+2	4.1E+01	4.6E+00
35	CLX4	09/09/99 1030	09/10/99 1030	1440	24.0	4.3	<MDL	<MDL	<MDL
36	MES5	09/13/99 0830	09/14/99 0830	1440	24.0	4.3	1.13E+2	2.6E+01	3.0E+00
37	WES5	09/13/99 0850	09/14/99 0850	1440	24.0	4.3	Det	Det	Det
38	ELC5	09/13/99 0920	09/14/99 0925	1445	24.1	4.3	<MDL	<MDL	<MDL
39	HFD5	09/13/99 0945	09/14/99 0955	1450	24.2	4.4	<MDL	<MDL	<MDL
40	CLX5	09/13/99 1005	09/14/99 1015	1450	24.2	4.4	Det	Det	Det
41	MES6	09/14/99 0830	09/15/99 0825	1435	23.9	4.3	Det	Det	Det
42	WES6	09/14/99 0850	09/15/99 0850	1440	24.0	4.3	Det	Det	Det
43	ELC6	09/14/99 0925	09/15/99 0925	1440	24.0	4.3	<MDL	<MDL	<MDL
44	HFD6	09/14/99 0955	09/15/99 0945	1430	23.8	4.3	<MDL	<MDL	<MDL
45	CLX6	09/14/99 1015	09/15/99 1005	1430	23.8	4.3	Det	Det	Det
46	MES7	09/15/99 0825	09/16/99 0845	1460	24.3	4.4	7.29E+1	1.7E+01	1.9E+00
47	MES7D	09/15/99 0825	09/16/99 0845	1460	24.3	4.4	7.54E+1	1.7E+01	2.0E+00
48	WES7	09/15/99 0850	09/16/99 0905	1455	24.2	4.4	8.71E+1	2.0E+01	2.3E+00
49	WES7D	09/15/99 0850	09/16/99 0905	1455	24.2	4.4	1.05E+2	2.4E+01	2.7E+00
50	ELC7	09/15/99 0925	09/16/99 0935	1450	24.2	4.4	<MDL	<MDL	<MDL
51	ELC7D	09/15/99 0925	09/16/99 0935	1450	24.2	4.4	<MDL	<MDL	<MDL
52	HFD7	09/15/99 0945	09/16/99 1000	1455	24.2	4.4	Det	Det	Det
53	HFD7D	09/15/99 0945	09/16/99 1000	1455	24.2	4.4	Det	Det	Det
54	CLX7	09/15/99 1005	09/16/99 1020	1455	24.2	4.4	Det	Det	Det

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 7. Cycloate Ambient Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
55	CLX7D	09/15/99 1005	09/16/99 1020	1455	24.2	4.4	Det	Det	Det
57	MES8	09/16/99 0845	09/17/99 0835	1430	23.8	4.3	Det	Det	Det
58	WES8	09/16/99 0905	09/17/99 0905	1440	24.0	4.3	Det	Det	Det
59	ELC8	09/16/99 0935	09/17/99 0935	1440	24.0	4.3	Det	Det	Det
60	HFD8	09/16/99 1000	09/17/99 0955	1435	23.9	4.3	2.24E+2	5.2E+01	5.9E+00
61	CLX8	09/16/99 1020	09/17/99 1015	1435	23.9	4.3	<MDL	<MDL	<MDL
62	MES9	09/20/99 0825	09/21/99 0830	1445	24.1	4.3	1.16E+2	2.7E+01	3.0E+00
63	WES9	09/20/99 0845	09/21/99 0855	1450	24.2	4.4	1.31E+2	3.0E+01	3.4E+00
64	ELC9	09/20/99 0915	09/21/99 0925	1450	24.2	4.4	Det	Det	Det
65	HFD9	09/20/99 0940	09/21/99 0950	1450	24.2	4.3	5.45E+2	1.3E+02	1.4E+01
66	CLX9	09/20/99 1000	09/21/99 1010	1450	24.2	4.4	Det	Det	Det
67	MES10	09/21/99 0830	09/22/99 0830	1440	24.0	4.3	1.41E+2	3.3E+01	3.7E+00
68	WES10	09/21/99 0855	09/22/99 0855	1440	24.0	4.3	9.38E+1	2.2E+01	2.5E+00
69	ELC10	09/21/99 0925	09/22/99 0930	1445	24.1	4.3	Det	Det	Det
70	HFD10	09/21/99 0950	09/22/99 0950	1440	24.0	4.3	1.13E+2	2.6E+01	3.0E+00
71	CLX10	09/21/99 1000	09/22/99 1005	1445	24.1	4.3	Det	Det	Det
73	MES11	09/22/99 0830	09/23/99 0830	1440	24.0	4.3	<MDL	<MDL	<MDL
74	MES11D	09/22/99 0830	09/23/99 0830	1440	24.0	4.3	7.30E+1	1.7E+01	1.9E+00
75	WES11	09/22/99 0855	09/23/99 0900	1445	24.1	4.3	1.02E+2	2.4E+01	2.7E+00
76	WES11D	09/22/99 0855	09/23/99 0900	1445	24.1	4.3	1.02E+2	2.4E+01	2.7E+00
77	ELC11	09/22/99 0930	09/23/99 0935	1445	24.1	4.3	Det	Det	Det
78	ELC11D	09/22/99 0930	09/23/99 0935	1445	24.1	4.3	Det	Det	Det
79	HFD11	09/22/99 0950	09/23/99 1000	1450	24.2	4.4	6.95E+2	1.6E+02	1.8E+01
80	HFD11D	09/22/99 0950	09/23/99 1000	1450	24.2	4.4	9.64E+2	2.2E+02	2.5E+01
81	CLX11	09/22/99 1005	09/23/99 1015	1450	24.2	4.4	3.71E+2	8.5E+01	9.7E+00
82	CLX11D	09/22/99 1005	09/23/99 1015	1450	24.2	4.4	3.97E+2	9.1E+01	1.0E+01
83	MES12	09/23/99 0830	09/24/99 0845	1455	24.3	4.4	8.09E+1	1.9E+01	2.1E+00

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 7. Cycloate Ambient Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
84	WES12	09/23/99 0900	09/24/99 0915	1455	24.2	4.4	8.19E+1	1.9E+01	2.1E+00
85	ELC12	09/23/99 0935	09/24/99 1000	1465	24.4	4.4	7.42E+1	1.7E+01	1.9E+00
86	HFD12	09/23/99 1000	09/24/99 1025	1465	24.4	4.4	1.42E+2	3.2E+01	3.7E+00
87	CLX12	09/23/99 1015	09/24/99 1040	1465	24.4	4.4	7.41E+1	1.7E+01	1.9E+00
88	MES13	09/27/99 0905	09/28/99 0930	1465	24.4	4.4	Det	Det	Det
89	WES13	09/27/99 0930	09/28/99 1000	1470	24.5	4.4	Det	Det	Det
90	ELC13	09/27/99 0955	09/28/99 0850	1375	22.9	4.1	Det	Det	Det
91	HFD13	09/27/99 1015	09/28/99 1040	1465	24.4	4.4	1.20E+2	2.7E+01	3.1E+00
92	CLX13	09/27/99 1040	09/28/99 1100	1460	24.3	4.4	Det	Det	Det
93	MES14	09/28/99 0930	09/29/99 0840	1390	23.2	4.2	Det	Det	Det
94	WES14	09/28/99 1000	09/29/99 0905	1385	23.1	4.2	Det	Det	Det
95	ELC14	09/28/99 0850	09/29/99 0945	1495	24.9	4.5	<MDL	<MDL	<MDL
96	HFD14	09/28/99 1040	09/29/99 1005	1405	23.4	4.2	Det	Det	Det
97	CLX14	09/28/99 1100	09/29/99 1030	1410	23.5	4.2	Det	Det	Det
102	MES15	09/29/99 0840	09/30/99 0830	1430	23.8	4.3	Det	Det	Det
103	MES15D	09/29/99 0840	09/30/99 0830	1430	23.8	4.3	Det	Det	Det
104	WES15	09/29/99 0905	09/30/99 0855	1430	23.8	4.3	Det	Det	Det
105	WES15D	09/29/99 0905	09/30/99 0855	1430	23.8	4.3	Det	Det	Det
106	ELC15	09/29/99 0945	09/30/99 0930	1425	23.8	4.3	<MDL	<MDL	<MDL
107	ELC15D	09/29/99 0945	09/30/99 0930	1425	23.8	4.3	<MDL	<MDL	<MDL
108	HFD15	09/29/99 1005	09/30/99 0950	1425	23.7	4.3	Det	Det	Det
109	HFD15D	09/29/99 1005	09/30/99 0950	1425	23.7	4.5	Det	Det	Det
110	CLX15	09/29/99 1030	09/30/99 1030	1440	24.0	4.3	Det	Det	Det
111	CLX15D	09/29/99 1030	09/30/99 1030	1440	24.0	4.3	Det	Det	Det
116	MES16	09/30/99 0830	10/01/99 0830	1440	24.0	4.6	Det	Det	Det
117	WES16	09/30/99 0855	10/01/99 0855	1440	24.0	4.3	Det	Det	Det
118	ELC16	09/30/99 0930	10/01/99 0930	1440	24.0	4.3	Det	Det	Det

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 7. Cycloate Ambient Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
119	HFD16	09/30/99 0950	10/01/99 0945	1435	23.9	4.3	Det	Det	Det
120	CLX16	09/30/99 1030	10/01/99 1030	1440	24.0	4.3	Det	Det	Det
121	MES17	10/04/99 0845	10/05/99 0835	1430	23.8	4.3	<MDL	<MDL	<MDL
122	WES17	10/04/99 0910	10/05/99 0900	1430	23.8	4.3	<MDL	<MDL	<MDL
123	ELC17	10/04/99 0940	10/05/99 0930	1430	23.8	4.3	<MDL	<MDL	<MDL
124	HFD17	10/04/99 1005	10/05/99 0950	1425	23.7	4.3	Det	Det	Det
125	CLX17	10/04/99 1040	10/05/99 1020	1420	23.7	4.3	Det	Det	Det
126	MES18	10/05/99 0835	10/06/99 0840	1445	24.1	4.3	Det	Det	Det
127	WES18	10/05/99 0900	10/06/99 0910	1450	24.2	4.4	<MDL	<MDL	<MDL
128	ELC18	10/05/99 0930	10/06/99 0945	1455	24.2	4.4	<MDL	<MDL	<MDL
129	HFD18	10/05/99 0950	10/06/99 1000	1450	24.2	4.4	<MDL	<MDL	<MDL
130	CLX18	10/05/99 1020	10/06/99 1030	1450	24.2	4.4	<MDL	<MDL	<MDL
131	MES19	10/06/99 0840	10/07/99 0940	1500	25.0	4.5	<MDL	<MDL	<MDL
132	MES19D	10/06/99 0840	10/07/99 0940	1500	25.0	4.5	<MDL	<MDL	<MDL
133	WES19	10/06/99 0910	10/07/99 0920	1450	24.2	4.4	Det	Det	Det
134	WES19D	10/06/99 0910	10/07/99 0920	1450	24.2	4.4	Det	Det	Det
135	ELC19	10/06/99 0945	10/07/99 0845	1380	23.0	4.1	<MDL	<MDL	<MDL
136	ELC19D	10/06/99 0945	10/07/99 0845	1380	23.0	4.1	<MDL	<MDL	<MDL
137	HFD19	10/06/99 1000	10/07/99 1040	1480	24.7	4.4	<MDL	<MDL	<MDL
138	HFD19D	10/06/99 1000	10/07/99 1040	1480	24.7	4.4	<MDL	<MDL	<MDL
139	CLX19	10/06/99 1030	10/07/99 1115	1485	24.8	4.5	<MDL	<MDL	<MDL
140	CLX19D	10/06/99 1030	10/07/99 1115	1485	24.8	4.5	<MDL	<MDL	<MDL
142	MES20	10/07/99 0940	10/08/99 0835	1375	22.9	4.1	<MDL	<MDL	<MDL
143	WES20	10/07/99 0920	10/08/99 0900	1420	23.7	4.3	Det	Det	Det
144	ELC20	10/07/99 0845	10/08/99 0930	1485	24.8	4.5	<MDL	<MDL	<MDL
145	HFD20	10/07/99 1040	10/08/99 1000	1400	23.3	4.2	<MDL	<MDL	<MDL
146	CLX20	10/07/99 1115	10/08/99 1015	1380	23.0	4.1	<MDL	<MDL	<MDL

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 7. Cycloate Ambient Monitoring Results

Log-#	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Time (hours)	Sample Volume (m3)	Cycloate Sample Results		
							ng/sample	(ng/m3)	*(pptv)
147	MES21	10/12/99 0825	10/13/99 0810	1425	23.8	4.3	Det	Det	Det
148	WES21	10/12/99 0855	10/13/99 0835	1420	23.7	4.3	1.53E+2	3.6E+01	4.1E+00
149	ELC21	10/12/99 0930	10/13/99 0900	1410	23.5	4.2	<MDL	<MDL	<MDL
150	HFD21	10/12/99 0950	10/13/99 0920	1410	23.5	4.2	6.87E+1	1.6E+01	1.8E+00
151	CLX21	10/12/99 1020	10/13/99 0940	1400	23.3	4.2	<MDL	<MDL	<MDL
152	MES22	10/13/99 0810	10/14/99 0825	1455	24.2	4.4	<MDL	<MDL	<MDL
153	MES22D	10/13/99 0810	10/14/99 0825	1455	24.2	4.4	Det	Det	Det
154	WES22	10/13/99 0835	10/14/99 0900	1465	24.4	4.6	Det	Det	Det
155	WES22D	10/13/99 0835	10/14/99 0900	1465	24.4	4.7	Det	Det	Det
156	ELC22	10/13/99 0900	10/14/99 0930	1470	24.5	4.4	<MDL	<MDL	<MDL
157	ELC22D	10/13/99 0900	10/14/99 0930	1470	24.5	4.4	<MDL	<MDL	<MDL
158	HFD22	10/13/99 0920	10/14/99 0945	1465	24.4	4.4	Det	Det	Det
159	HFD22D	10/13/99 0920	10/14/99 0945	1465	24.4	4.4	6.43E+1	1.5E+01	1.7E+00
160	CLX22	10/13/99 0940	10/14/99 1010	1470	24.5	4.4	Det	Det	Det
161	CLX22D	10/13/99 0940	10/14/99 1010	1470	24.5	4.4	Det	Det	Det
163	MES23	10/14/99 0825	10/15/99 0845	1460	24.3	4.4	<MDL	<MDL	<MDL
164	WES23	10/14/99 0900	10/15/99 0945	1485	24.8	4.5	<MDL	<MDL	<MDL
165	ELC23	10/14/99 0930	10/15/99 1020	1490	24.8	4.5	<MDL	<MDL	<MDL
166	HFD23	10/14/99 0945	10/15/99 1045	1500	25.0	4.5	Det	Det	Det
167	CLX23	10/14/99 1010	10/15/99 1110	1500	25.0	4.5	<MDL	<MDL	<MDL

MDL = 12.6 ng/sample
Det = Value was below the EQL of 63.0 ng/sample but ≥MDL
*pptv at 25 C and 1 atm
NA = Not Applicable

Table 8. Summary of Cycloate Ambient Results (ng/m3)

Start Date	CLX	ELC	HFD	MES	WES
09/02/99	<MDL	<MDL	<MDL	<MDL	<MDL
09/07/99	<MDL	<MDL	<MDL	Det	<MDL
09/08/99	<MDL	19	<MDL	<MDL	38
09/09/99	<MDL	17	41	Det	Det
09/13/99	Det	<MDL	<MDL	26	Det
09/14/99	Det	<MDL	<MDL	Det	Det
09/15/99	Det	<MDL	Det	17	24
09/16/99	<MDL	Det	52	Det	Det
09/20/99	Det	Det	125	27	30
09/21/99	Det	Det	26	33	22
09/22/99	91	Det	220	17	24
09/23/99	17	17	32	19	19
09/27/99	Det	Det	27	Det	Det
09/28/99	Det	<MDL	Det	Det	Det
09/29/99	Det	<MDL	Det	Det	Det
09/30/99	Det	Det	Det	Det	Det
10/04/99	Det	<MDL	Det	<MDL	<MDL
10/05/99	<MDL	<MDL	<MDL	Det	<MDL
10/06/99	<MDL	<MDL	<MDL	<MDL	Det
10/07/99	<MDL	<MDL	<MDL	<MDL	Det
10/12/99	<MDL	<MDL	16	Det	36
10/13/99	Det	<MDL	15	<MDL	Det
10/14/99	<MDL	<MDL	Det	Det	<MDL

Maximum	**91**	**19**	**220**	**33**	**38**
Average	**9.5**	**5.5**	**25.0**	**11.0**	**13.0**
# Samples	**23**	**23**	**23**	**23**	**23**
# >EQL	**2**	**3**	**9**	**6**	**7**
# Det	**11**	**6**	**6**	**11**	**11**
# <MDL	**10**	**14**	**8**	**6**	**5**

Only the higher value of each collocated pair was used to calculate the above statistics.
"Det" results were factored into the average as (MDL+EQL)/2 = 8.76 ng/m3.
<MDL results were factored into the average as MDL/2 = 1.46 ng/m3.
Assume a 4.32 m3 sample volume for the above MDL and EQL.

Table 9. Cycloate Ambient Collocated Results

Sample ID	Cycloate (ng/m3)	Average	Relative Difference
CLX1	<MDL		
CLX1Da	<MDL		
CLX1Db	<MDL		
CLX1Dc	<MDL	NA	NA
CLX2	<MDL		
CLX2D	<MDL	NA	NA
CLX3	<MDL		
CLX3Da	<MDL		
CLX3Db	<MDL		
CLX3Dc	<MDL	NA	NA
CLX7	Det		
CLX7D	Det	NA	NA
CLX11	85		
CLX11D	91	88	7%
CLX15	Det		
CLX15D	Det	NA	NA
CLX19	<MDL		
CLX19D	<MDL	NA	NA
CLX22	Det		
CLX22D	Det	NA	NA
ELC1	<MDL		
ELC1D	<MDL	NA	NA
ELC3	18		
ELC3D	19	19	1%
ELC7	<MDL		
ELC7D	<MDL	NA	NA
ELC11	Det		
ELC11D	Det	NA	NA
ELC15	<MDL		
ELC15D	<MDL	NA	NA
ELC19	<MDL		
ELC19D	<MDL	NA	NA
ELC22	<MDL		
ELC22D	<MDL	NA	NA
HFD1	<MDL		
HFD1D	<MDL	NA	NA
HFD3	<MDL		
HFD3D	<MDL	NA	NA

Sample ID	Cycloate (ng/m3)	Average	Relative Difference
HFD7	Det		
HFD7D	Det	NA	NA
HFD11	160		
HFD11D	220	190	32%
HFD15	Det		
HFD15D	Det	NA	NA
HFD19	<MDL		
HFD19D	<MDL	NA	NA
HFD22	Det		
HFD22D	15	NA	NA
MES1	<MDL		
MES1D	<MDL	NA	NA
MES3	<MDL		
MES3D	<MDL	NA	NA
MES7	17		
MES7D	17	17	0%
MES11	<MDL		
MES11D	17	NA	NA
MES15	Det		
MES15D	Det	NA	NA
MES19	<MDL		
MES19D	<MDL	NA	NA
MES22	<MDL		
MES22D	Det	NA	NA
WES1	<MDL		
WES1D	<MDL	NA	NA
WES3	38		
WES3D	37	37	3%
WES7	20		
WES7D	24	22	19%
WES11	24		
WES11D	24	24	0%
WES15	Det		
WES15D	Det	NA	NA
WES19	Det		
WES19D	Det	NA	NA
WES22	Det		
WES22D	Det	NA	NA

Table 10. Cycloate *Application Lab* Spike Results

Sample ID	Cycloate Amount (ng)	Expected Amount (ng)	Percent Recovery
LS-1	635	600	106%
LS-2	642	600	107%
LS-3	580	600	97%
LS-4	634	600	106%
		Ave.=	104%

Table 11. Cycloate *Application Trip* Spike Results

Sample ID	Cycloate Amount (ng)	Expected Amount (ng)	Percent Recovery
TS-1	504	600	84%
TS-2	622	600	104%
TS-3	606	600	101%
TS-4	577	600	96%
		Ave.=	96%

Table 12. Cycloate *Application Field* Spike Results

Sample ID	Cycloate Amount (ng)	Background* Amount (ng)	Corrected Amount (ng)	Expected Amount (ng)	Percent Recovery
NFS1	579	<MDL	579	600	97%
SFS2	512	<MDL	512	600	85%
WFS3	472	<MDL	472	600	79%
EFS4	527	<MDL	527	600	88%
				Ave.=	87%

*Amount of cycloate found in the collocated background sample.

Table 13. Cycloate *Ambient Lab* Spike Results

Sample ID	Cycloate Amount (ng)	Expected Amount (ng)	Percent Recovery
CAL922-1	276	300	92%
CAL922-2	283	300	94%
CAL922-3	261	300	87%
CAL922-4	266	300	89%
		Ave.=	91%

Table 14. Cycloate *Ambient Trip* Spike Results

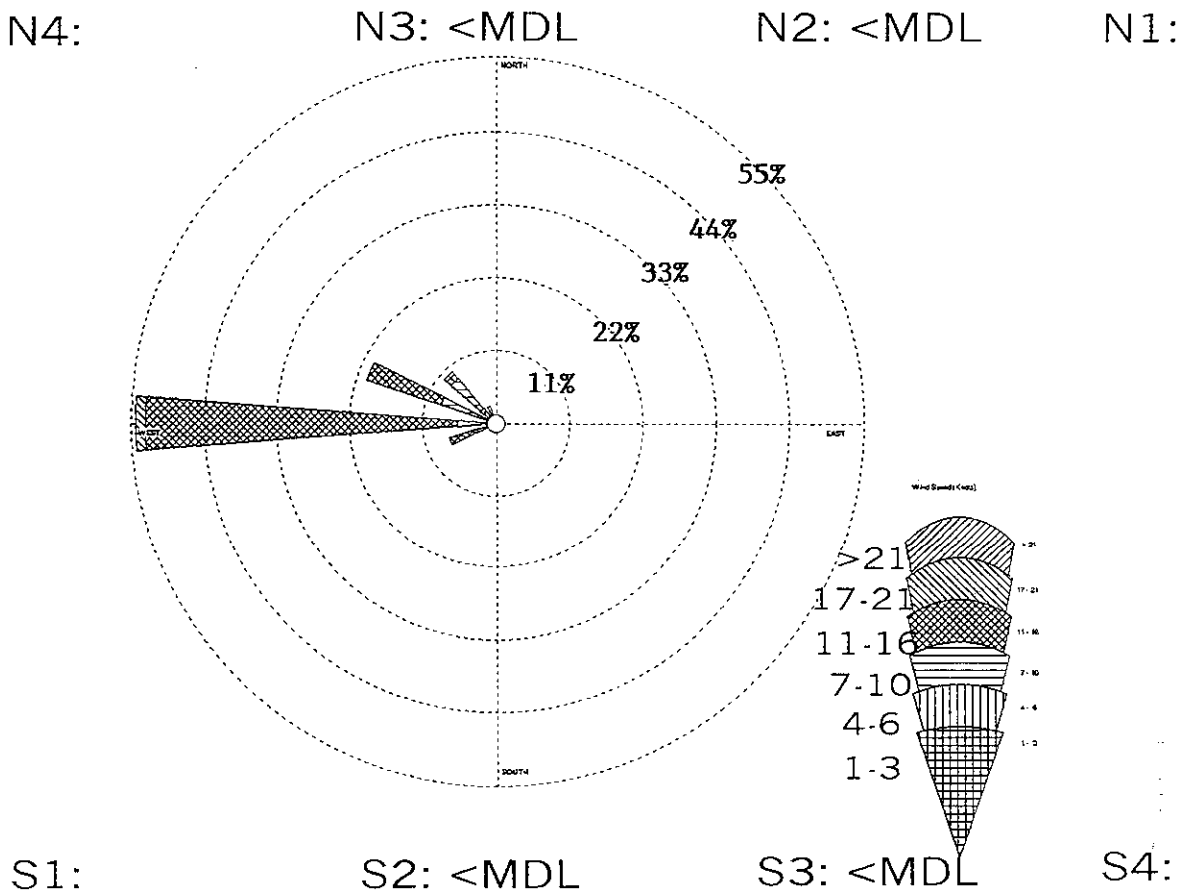
Sample ID	Cycloate Amount (ng)	Expected Amount (ng)	Percent Recovery
CAT922-1	299	300	100%
CAT922-2	273	300	91%
CAT922-3	272	300	91%
CAT922-4	269	300	90%
		Ave.=	93%

Table 15. Cycloate *Ambient Field* Spike Results

Sample ID	Cycloate Amount (ng)	Background* Amount (ng)	Corrected Amount (ng)	Expected Amount (ng)	Percent Recovery
CAF922-1	248	37.8	210	300	70%
CAF922-2	220	37.8	182	300	61%
CAF922-3	176	37.8	138	300	46%
CAF922-4	200	37.8	162	300	54%
				Ave.=	58%

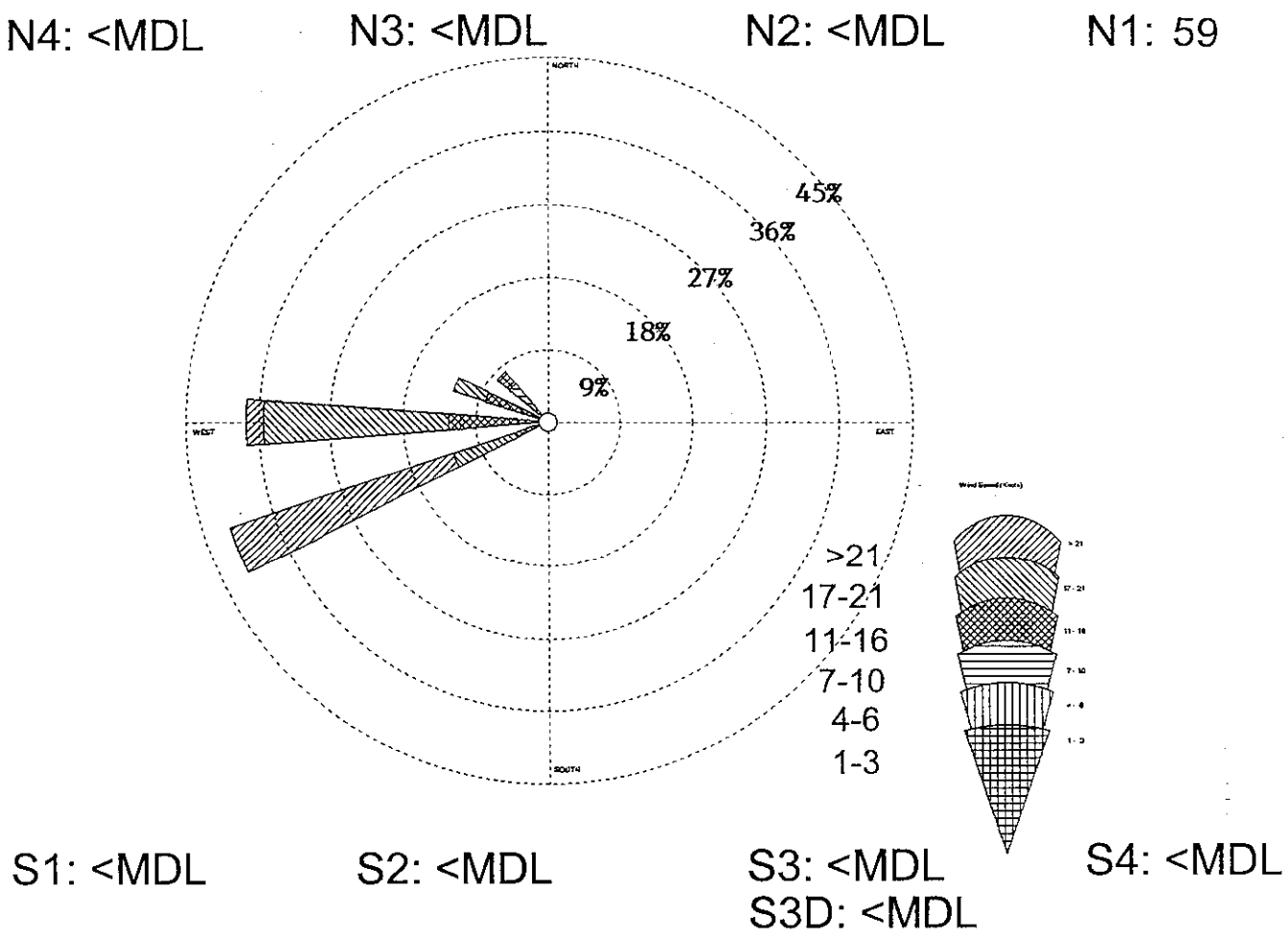
*Amount of cycloate found in the collocated ambient sample.
All background values were "detected" and were factored in as (MDL+EQL)/2 = 37.8 ng/sample.

Figure 4
Cycloate Air Monitoring Results (ng/m^3)
Background Period



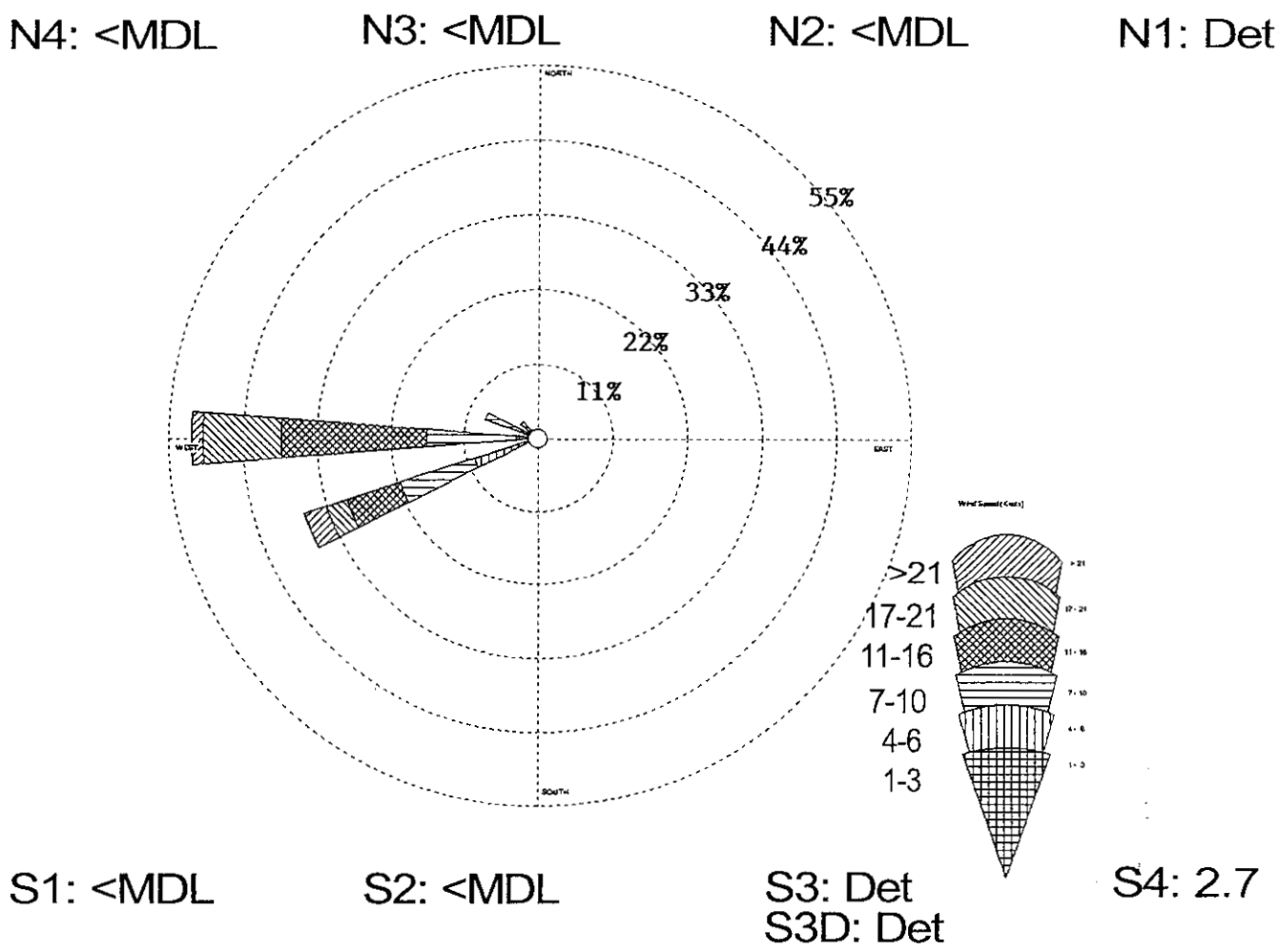
Company Name	Orientation	Avg. Wind Speed	Sample Date-Time
ARB	**Direction (blowing from)**	**10.7 Knots**	**10/05/99 1530 to 10/06/99 0630**
Display	Units	Calm Winds	Sample ID
Wind Speed	**Knots**	**0.0%**	**Background Period**

Figure 5
Cycloate Air Monitoring Results (ng/m^3)
Period 1



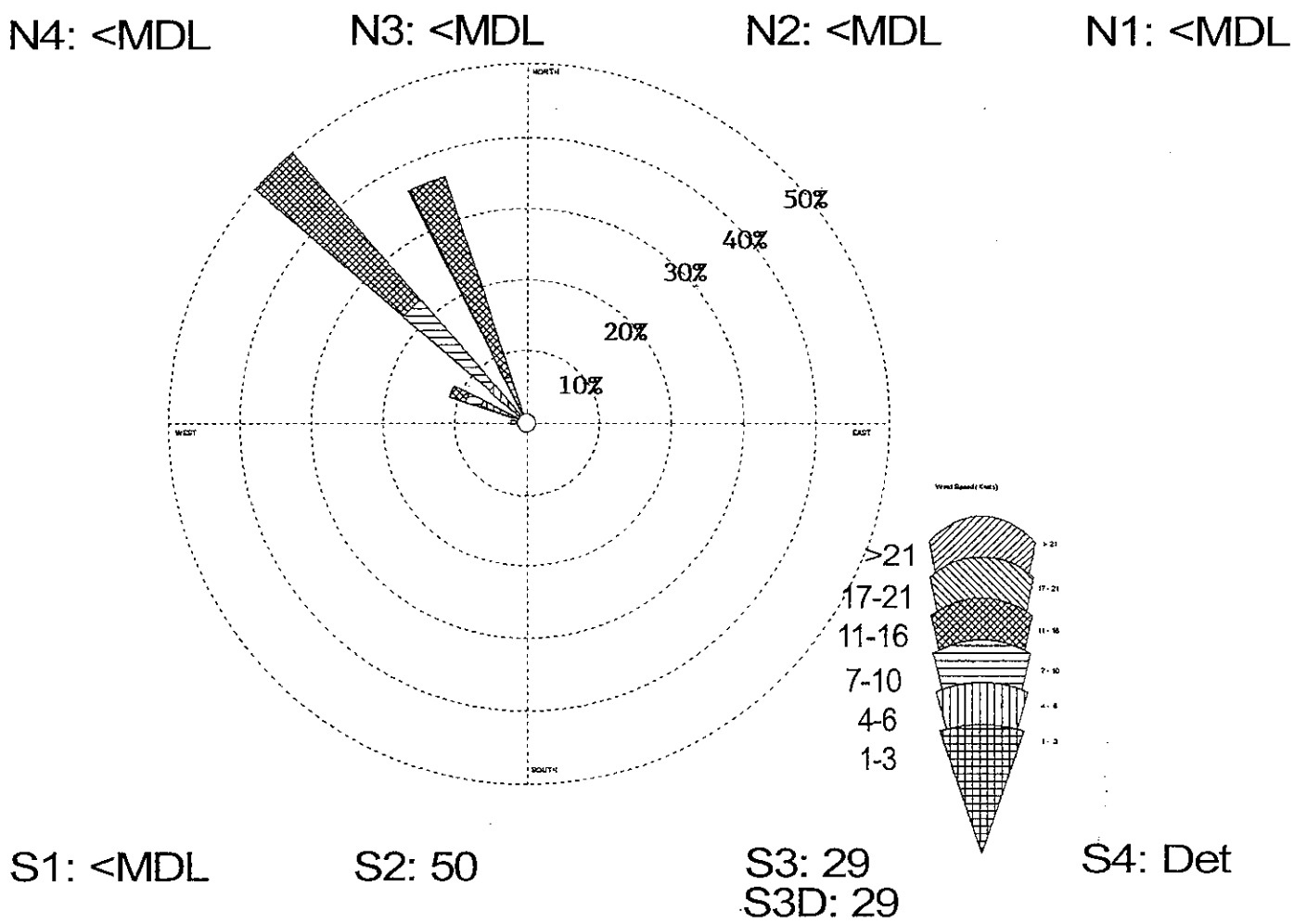
Company Name	Orientation	Avg. Wind Speed	Sample Date-Time
ARB	**Direction (blowing from)**	**18.2 Knots**	**10/06/99 0630 to 10/06/99 1645**
Display	Units	Calm Winds	Sample ID
Wind Speed	**Knots**	**0.0%**	**Period 1**

Figure 6
Cycloate Air Monitoring Results (ng/m^3)
Period 2



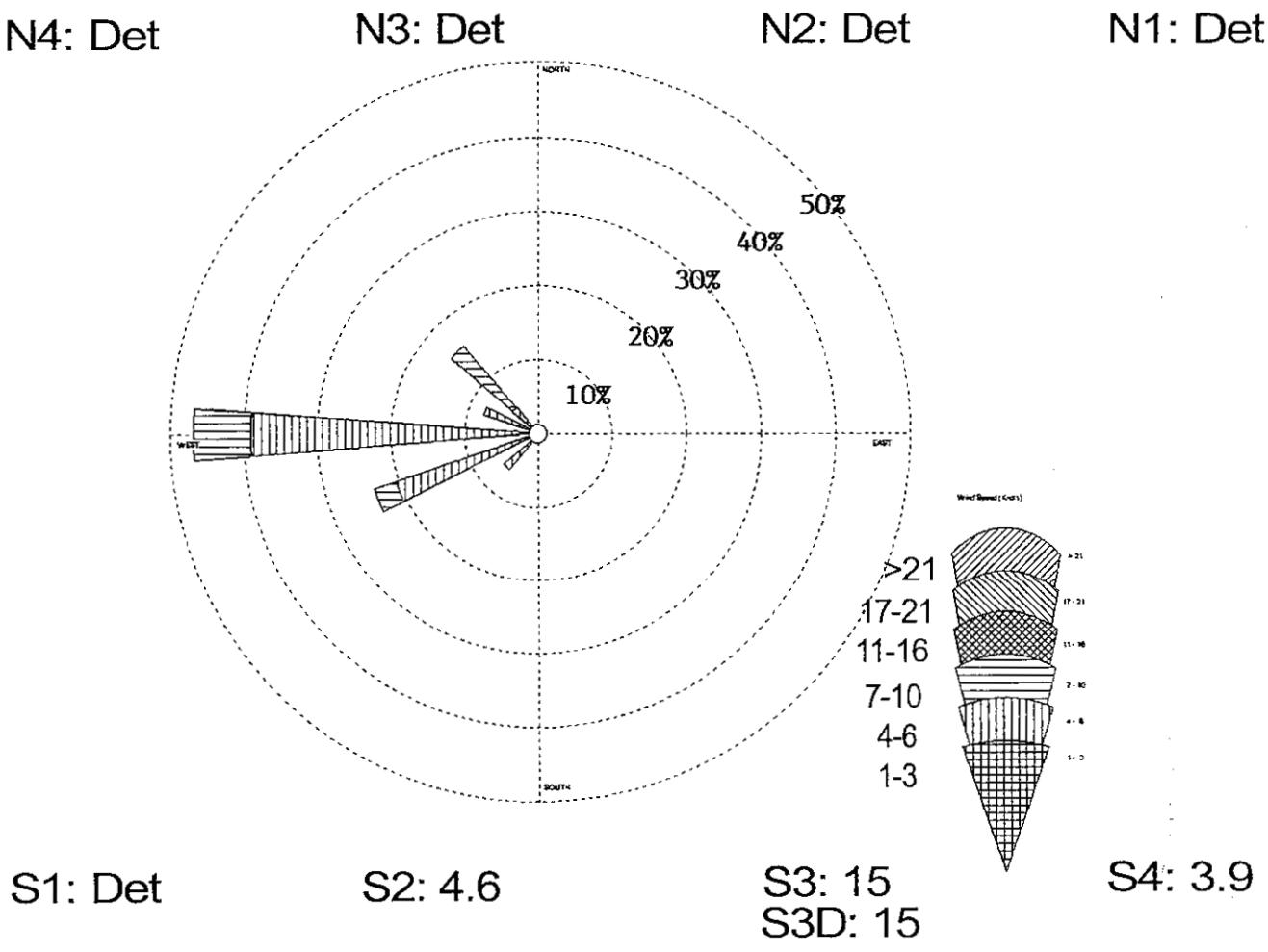
Company Name	Orientation	Avg. Wind Speed	Sample Date-Time
ARB	**Direction (blowing from)**	**11.33 Knots**	**10/06/99 1700 to 10/07/99 0700**
Display	Units	Calm Winds	Sample ID
Wind Speed	**Knots**	**0.0%**	**Period 2**

Figure 7
Cycloate Air Monitoring Results (ng/m^3)
Period 3



Company Name	Orientation	Avg. Wind Speed	Sample Date-Time
ARB	**Direction (blowing from)**	**10.48 Knots**	**10/07/99 0700 to 10/07/99 1700**
Display	Units	Calm Winds	Sample ID
Wind Speed	**Knots**	**0.0%**	**Period 3**

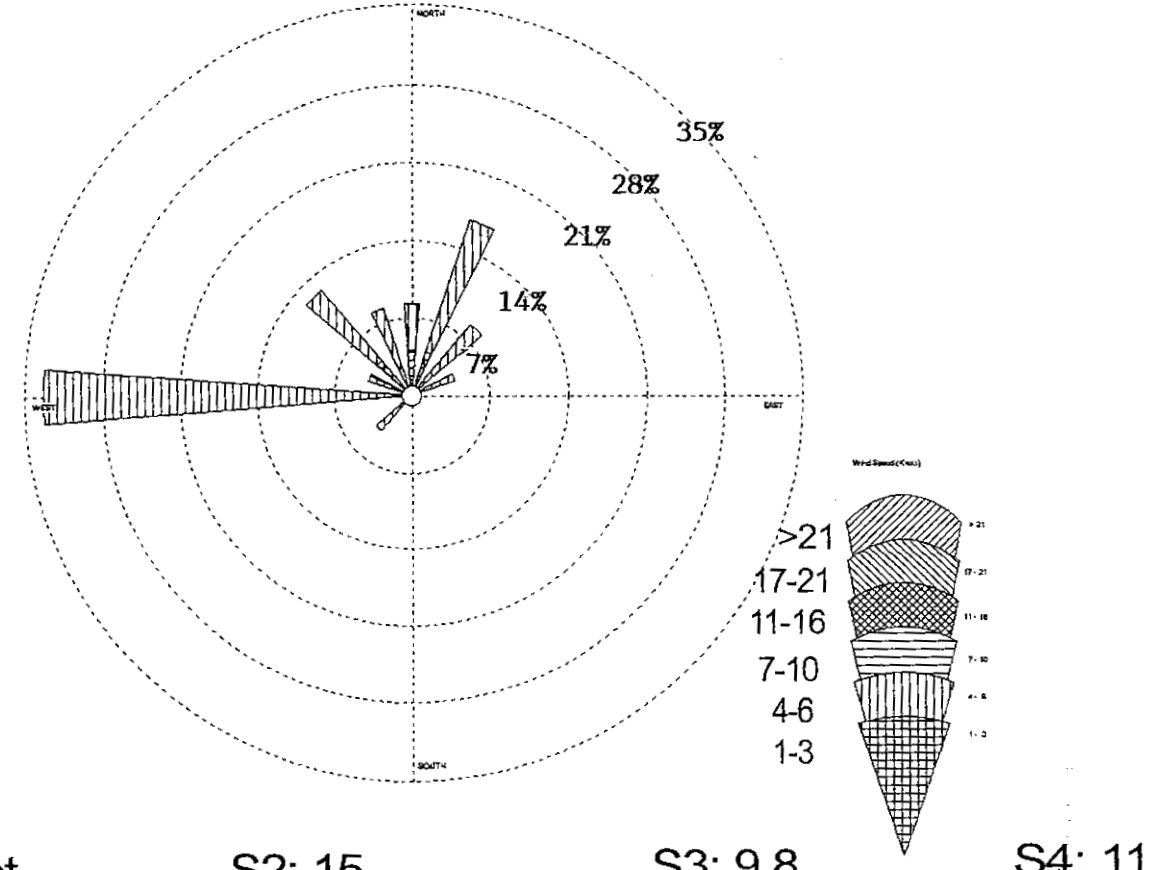
Figure 8
Cycloate Air Monitoring Results (ng/m^3)
Period 4



Company Name **ARB**	Orientation **Direction (blowing from)**	Avg. Wind Speed **5.72 Knots**	Sample Date-Time **10/07/99 1700 to 10/08/99 0730**
Display **Wind Speed**	Units **Knots**	Calm Winds **0.0%**	Sample ID **Period 4**

Figure 9
Cycloate Air Monitoring Results (ng/m^3)
Period 5

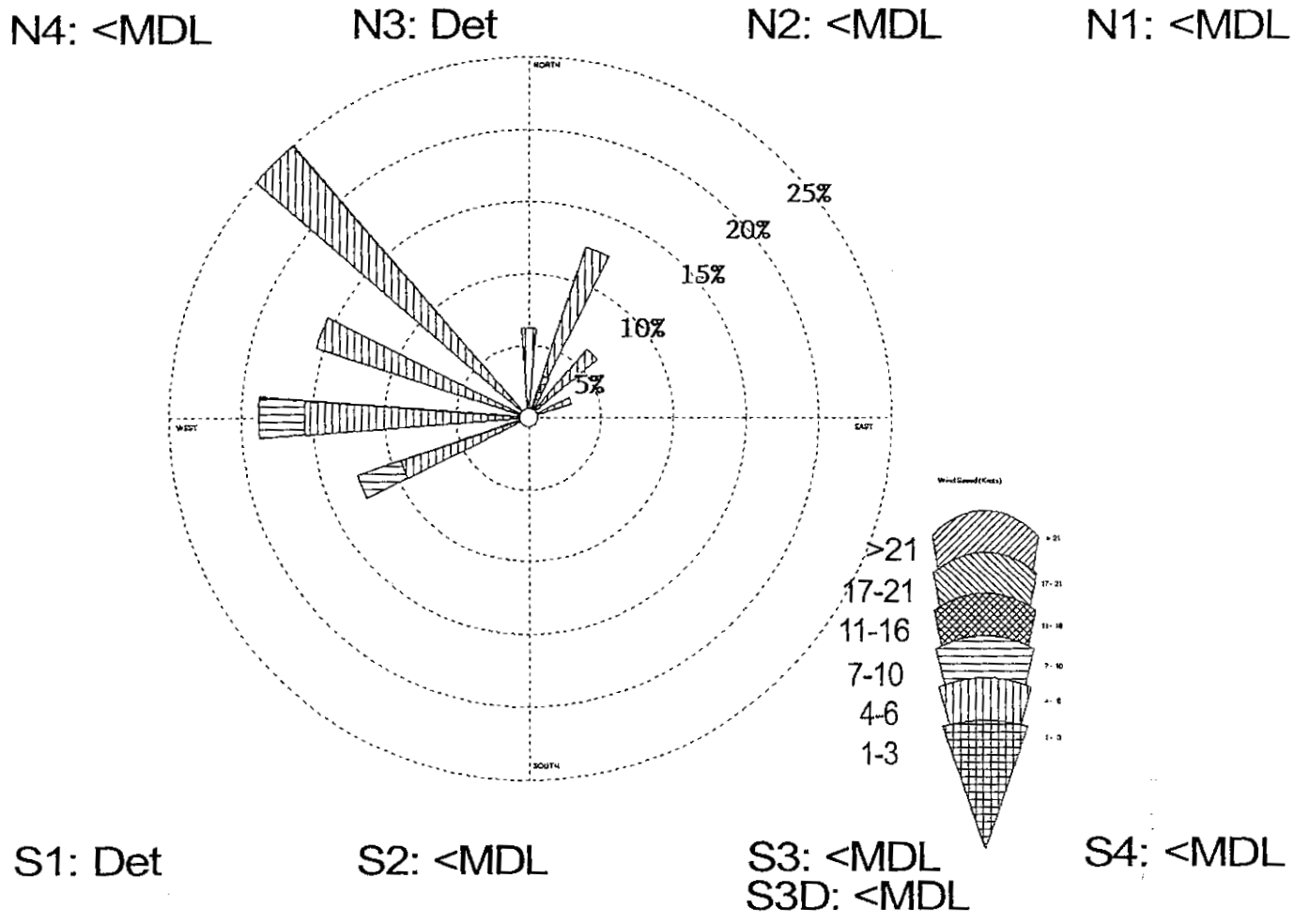
N4: <MDL N3: <MDL N2: <MDL N1: <MDL



S1: Det S2: 15 S3: 9.8 S3D: Det S4: 11

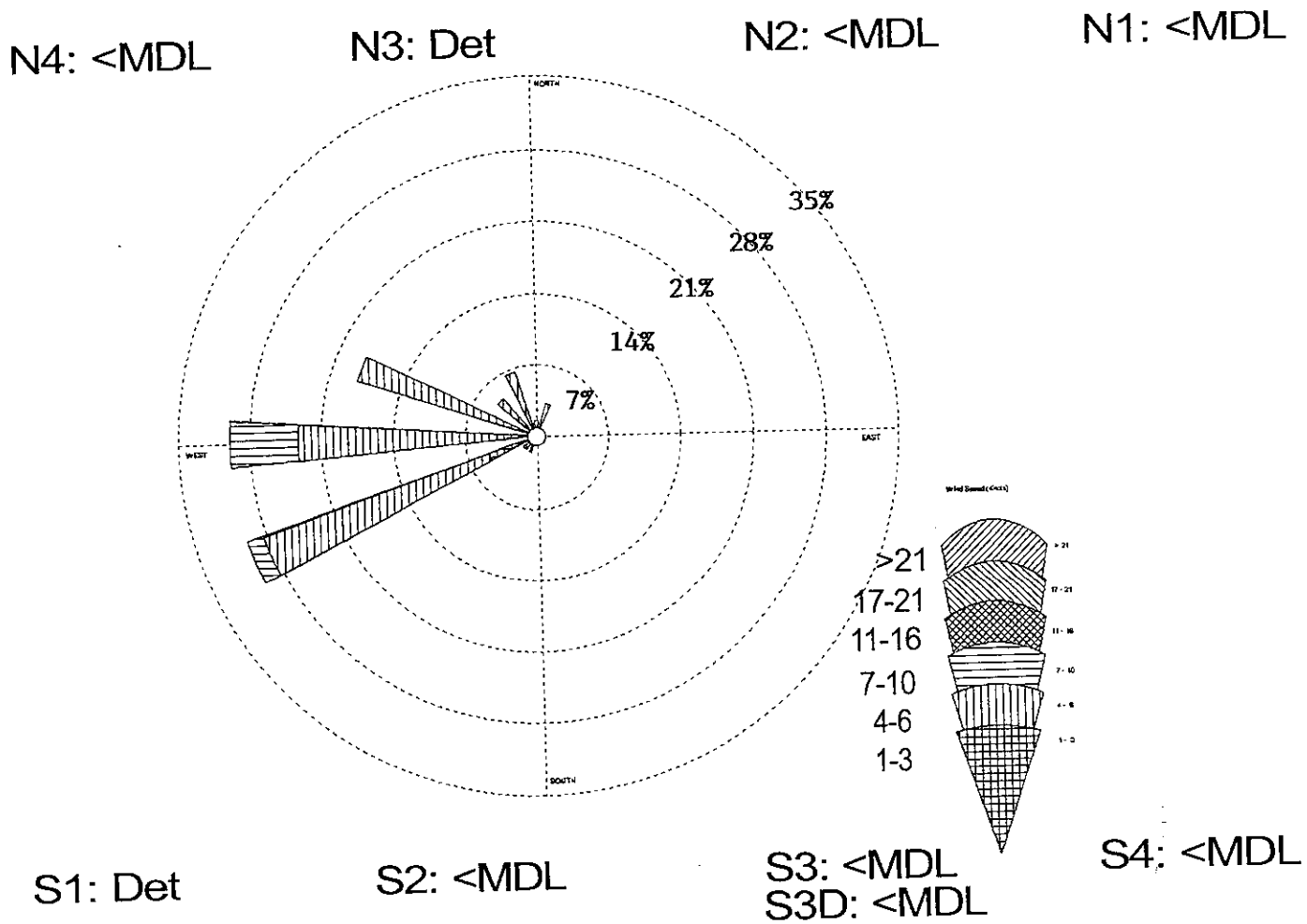
Company Name	Orientation	Avg. Wind Speed	Sample Date-Time
ARB	**Direction (blowing from)**	**4.40 Knots**	**10/08/99 0730 to 10/08/99 1130**
Display	Units	Calm Winds	Sample ID
Wind Speed	**Knots**	**0.0%**	**Period 5**

Figure 10
Cycloate Air Monitoring Results (ng/m^3)
Period 6



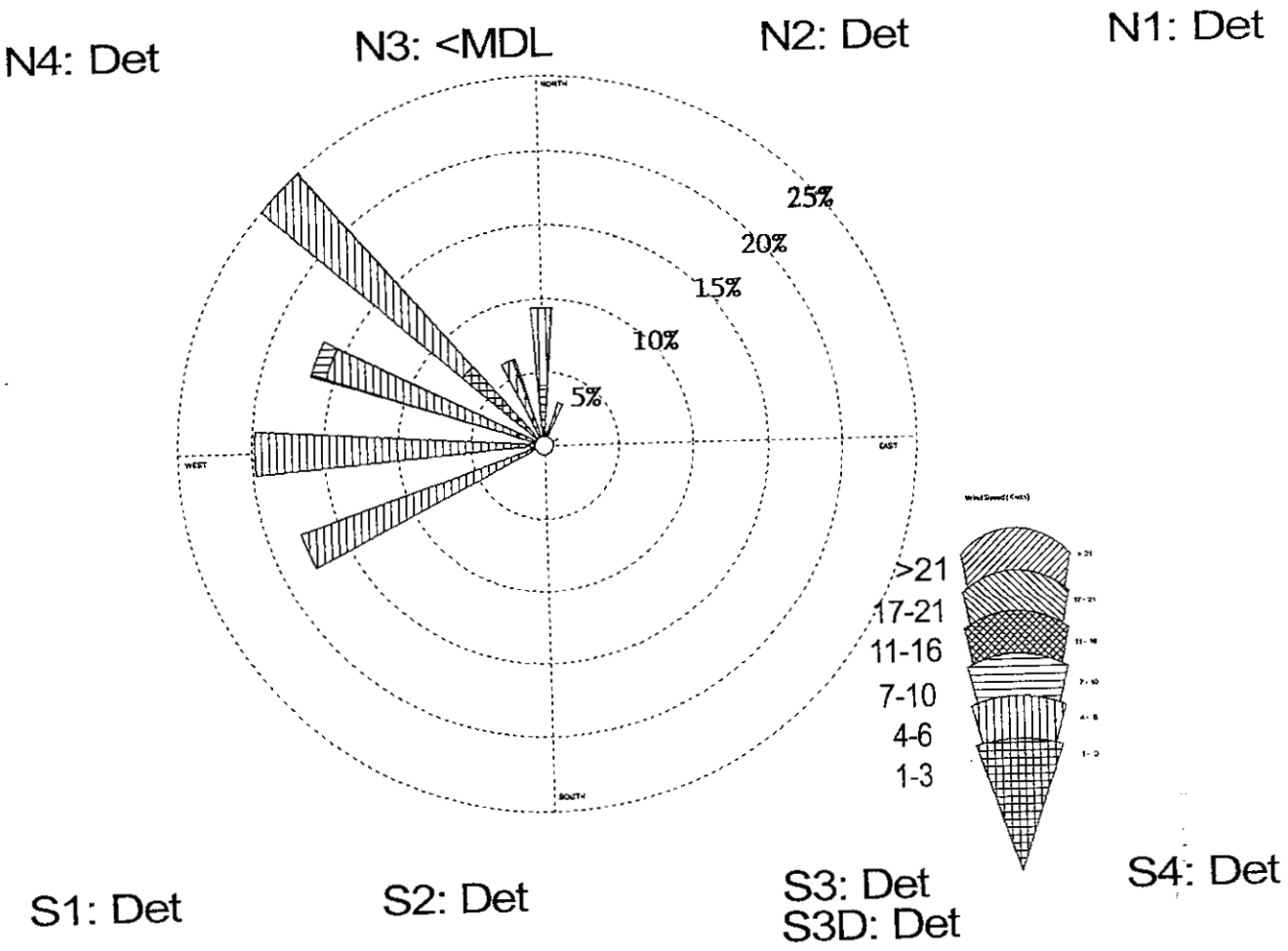
Company Name	Orientation	Avg. Wind Speed	Sample Date-Time
ARB	**Direction (blowing from)**	**4.95 Knots**	**10/08/99 1130 to 10/08/99 1800**
Display	Units	Calm Winds	Sample ID
Wind Speed	**Knots**	**0.0%**	**Period 6**

Figure 11
Cycloate Air Monitoring Results (ng/m^3)
Period 7



Company Name **ARB**	Orientation **Direction (blowing from)**	Avg. Wind Speed **5.09 Knots**	Sample Date-Time **10/08/99 1800 to 10/09/99 0745**
Display **Wind Speed**	Units **Knots**	Calm Winds **1.67%**	Sample ID **Period 7**

Figure 12
Cycloate Air Monitoring Results (ng/m^3)
Period 8



Company Name **ARB**	Orientation **Direction (blowing from)**	Avg. Wind Speed **4.36 Knots**	Sample Date-Time **10/09/99 0745 to 10/10/99 0745**
Display **Wind Speed**	Units **Knots**	Calm Winds **1.04%**	Sample ID **Period 8**

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

APPENDICES

FOR THE

Report for the Application And Ambient Air Monitoring for Cycloate

Engineering and Certification Branch

Monitoring and Laboratory Division

Project No. C99-084 (Ambient)
C99-084a (Application)

Date: October 15, 2001

APPENDIX I

SAMPLING PROTOCOL

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

Protocol for the Application and Ambient Air Monitoring of Cycloate In Imperial County During Fall, 1999

Engineering and Laboratory Branch
Monitoring and Laboratory Division

Project No.
C99-084 Ambient
C99- 084a Application

Date: August 12; 1999

APPROVED:

Kevin Mongar, Project Engineer

Cynthia L. Castronovo, Manager
Testing Section

George Lew, Chief
Engineering and Laboratory Branch

This protocol has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Protocol for the Application and Ambient
Air Monitoring of Cycloate
In Imperial County During Fall, 1999

I. Introduction

At the request (September 2, 1998 Memorandum, Okumura to Lew) of the California Department of Pesticide Regulation (DPR), the Air Resources Board (ARB) staff will determine airborne concentrations of the pesticide cycloate in Imperial County over a six week ambient monitoring program and over a three day application monitoring program. This monitoring will be done to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) which requires the ARB "to document the level of airborne emissions .... of pesticides which may be determined to pose a present or potential hazard..." when requested by the DPR. Monitoring is being conducted to coincide with the use of cycloate as a selective herbicide on sugarbeets.

The sampling and analysis for cycloate will follow the procedures and quality assurance guidelines described in the "Quality Assurance Plan for Pesticide Air Monitoring" (May 11, 1999 version)(Appendix I).

The draft method development results and "Standard Operating Procedures for the Analysis of Cycloate in Ambient Air" were not available at the time this protocol was written.

II. Chemical Properties of Cycloate

The following information on the physical/chemical properties of (S-ethyl cyclohexyl(ethyl)thiocarbamate) was obtained from the September 2, 1998 memorandum "Use Information and Air Monitoring Recommendation for the Pesticide Active Ingredient Cycloate."

Pure Cycloate (CAS:1134-23-2) exists as colorless liquid with an aromatic odor. Cycloate has a molecular formula of $C_{11}H_{21}NOS$ and a molecular weight of 215.37 g/mole. It has a water solubility of 9.5×10^{-1} mg/L at 25 °C, a Henry's Constant of 4.76×10^{-6} atm·m^3/mol at 25 °C, and a vapor pressure of approximately 1.60×10^{-3} mm Hg at 25 °C.

Soil-applied cycloate volatilizes readily from moist soil when it is applied to the soil's surface without incorporation. Volatilization does not play a large role in cycloate's loss from dry soils. Microbial breakdown plays a major role in cycloate's disappearance from soils, when cycloate is incorporated to a depth of two to three inches. Cycloate resists leaching in heavy clay and highly organic soils; however, in loamy sand it leached downwind three to six inches with application of eight inches of water. Under crop growing conditions, cycloate's reported half-life ranged from four to eight weeks in several soils.

In plants, cycloate is readily taken up by sugarbeet roots and translocated to the stems and leaves. Although not applied to foliar surfaces, cycloate is rapidly absorbed by leaves. Cycloate does not persist in plants. Within three days after treatment, cycloate is rapidly and completely metabolized in sugarbeet roots and foliage to ethyl-cyclohexlamine, carbon dioxide, amino acids, sugars, and other natural plant constituents.

The acute oral LD_{50} of cycloate is 2,000-3190 mg/kg and 3,160-4,100 mg/Kg for male and female rats, respectivley. The LC_{50} (96 hour) for rainbow trout is 4.5 mg/L and 10 ppm for mosquito fish. Cycloate entered the risk assessment process at DPR under the Birth Defect Prevention Act of 1984 based on its toxicity in animal studies. Damage to the nervous system was the major concern, however, cycloate also demonstrated chronic toxicity, oncogenicity and reproductive toxicity.

III. Sampling

Samples will be collected by passing a measured volume of ambient air through XAD-2 resin. The sampling tree is shown in Figure 1. The exposed XAD-2 resin tubes (SKC #226-30-06) are stored in an ice chest (on dry ice) or in a freezer until desorbed with organic solvent. The flow rate of 3 Lpm will be accurately measured and the sampling system operated continuously for 24 hours with the exact operating interval recorded in the log book. The tubes will be protected from direct sunlight and supported about 1.5 meters above the ground during application monitoring sampling periods and 1.5 meters above roof tops for the ambient monitoring. At the end of each sampling period, the tubes will be placed in culture tubes with an identification label affixed. Subsequent to sampling, the sample cartridges will be transported on dry ice, as soon as reasonably possible, to the ARB Monitoring and Laboratory Division laboratory for analysis. The samples will be stored in the freezer or extracted/analyzed immediately.

A rotameter is used to control sample flow rates. The flow rate is set to 3 LPM as measured using a digital mass flow meter (MFM) before the start of each sampling period. The flow rate is checked, using the MFM, at the end of each period. Samplers will be leak checked prior to and after each sampling period with the sampling cartridges installed. Any change in the flow rates will be recorded in the field log book. The field log book will also be used to record start and stop times, start and stop flow rates, sample identifications and any other significant data.

Ambient Monitoring

The use patterns for cycloate suggest that monitoring should occur in Imperial County during the months of September through mid October. Four sampling sites will be selected in relatively high-population areas or in areas frequented by people. At each site, 24 discrete 24-hour samples will be taken during the sampling period. Background samples will be collected in an urban area distant to cycloate applications. Replicate (collocated) samples will be collected for six dates (each Wednesday) at each sampling location.

The sites will be selected by ARB personnel from the areas of Imperial County where sugarbeet farming is predominant. Sites will be selected for their proximity to the fields with considerations for both accessibility and security of the sampling equipment. The sites are near areas of historical use of cycloate. ARB understands that DPR staff will verify and quantify the actual use of cycloate that takes place during the study when the information becomes available. DPR recommends a target 24-hour detection limit of 0.0259 ug/m^3.

The samples will be collected by ARB personnel over a six week period from (tentatively)– September 1 – October 14, 1999. 24-hour samples will be taken Monday through Friday (4 samples/week) at a flow rate of 3 Lpm.

Application Monitoring

The use pattern for cycloate suggests that application-site monitoring should be conducted during the months of September or October in Imperial County, and that the monitoring be associated with applications of cycloate to sugarbeets at a rate of 4.0 pounds per acre or higher. Individual application monitoring schedules will vary based on the type and length of application but will follow the schedule guidelines outlined below in Table 2. Ideally, the monitoring study will include samples taken before, during and for approximately 72 hours following application.

TABLE 2. GUIDELINES FOR APPLICATION SAMPLING SCHEDULE

Sample period begins:	**Sample duration time**
Background (pre-application)	Minimum of 12 hours
During application	Length of application time
End of application	1 hour (or up to 1 hour before sunset) [1]
1 hour post-application	2 hours (or up to 1 hour before sunset) [1]
3 hour post-application	3 hours (or up to 1 hour before sunset) [1]
6 hour post-application	6 hours (or up to 1 hour before sunset) [1]
1 hour before sunset	Overnight[2] (until 1 hour after sunrise)
1 hour after sunrise	Daytime (until 1 hour before sunset)
1 hour before sunset	Overnight (until 1 hour after sunrise)
1 hour after sunrise	24-hour (until 1 hour after sunrise)

1 These sample duration times will be adjusted depending on length of application and time of sunset.

2 All overnight samples must include the period from one hour before sunset to one hour after sunrise. If the application extends beyond "1 hour before sunset" then the overnight sample will be started at the end of application.

Occasionally, a pesticide application may occur all day long and over the course of two or more days. In these instances samples are collected during the first daily application, followed by a

sample from end of application to 1 hour before sunset, followed by an overnight sample ending at either the start of application or 1 hour after sunrise the next morning (same for second or more application days). Following the end of the application, samples are collected according to the above schedule, starting with the 1-hour sample.

A minimum of four samplers will be positioned, one on each side of the field. A fifth sampler will be collocated at one position (downwind). Since cycloate is extensively used in the area, background (before application) samples should collect enough volume to achieve the recommended target 24-hour quantitation limit of 0.0259 ug/m^3 (minimum of 12 hours at 3 Lpm). Ideally, samplers should be placed at a minimum of 20 meters from the field. If possible the samplers will be spaced equidistant from the edges of the field.

We will also provide in the monitoring report: 1) An accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field, 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, etc., 3) meteorological data collected at a minimum of 15 minute intervals including wind speed and direction, humidity, and comments regarding degree of cloud cover, 4) the elevation of each sampling station with respect to the field and 5) the orientation of the field with respect to North (identified as either true or magnetic north). Samples collected during fog episodes will be designated as such.

IV. Analysis

The method development results and "Standard Operating Procedures for the Sampling and Analysis of Cycloate in Ambient Air" were not available for inclusion in this protocol. The procedures consist of extraction of the resin with an organic solvent followed by GC/MS analysis.

VI. Quality Assurance

Field Quality Control for the ambient monitoring will include:

1) Four field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling). The field spikes will be obtained by sampling ambient air at the background monitoring site for 24 hour periods at 10 Lpm (i.e., collocated with a background sample).

2) Four trip spikes prepared at the same level as the field spikes.

3) Four lab spikes prepared at the same level as the field and trip spikes.

4) Replicate samples will be taken for six dates at each sampling location.

5) A Trip blank will be obtained each week of sampling.

Field Quality Control for the application monitoring will include:

1) Four field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling). The field spikes will be obtained by sampling ambient air during background monitoring at the application site for the same duration as the background samples at 10 Lpm (i.e., collocated with background samples).

2) Four trip spikes prepared at the same level as the field spikes.

3) Four lab spikes prepared at the same level as the field and trip spikes.

4) Replicate samples will be taken for all samples at one of the sampling locations.

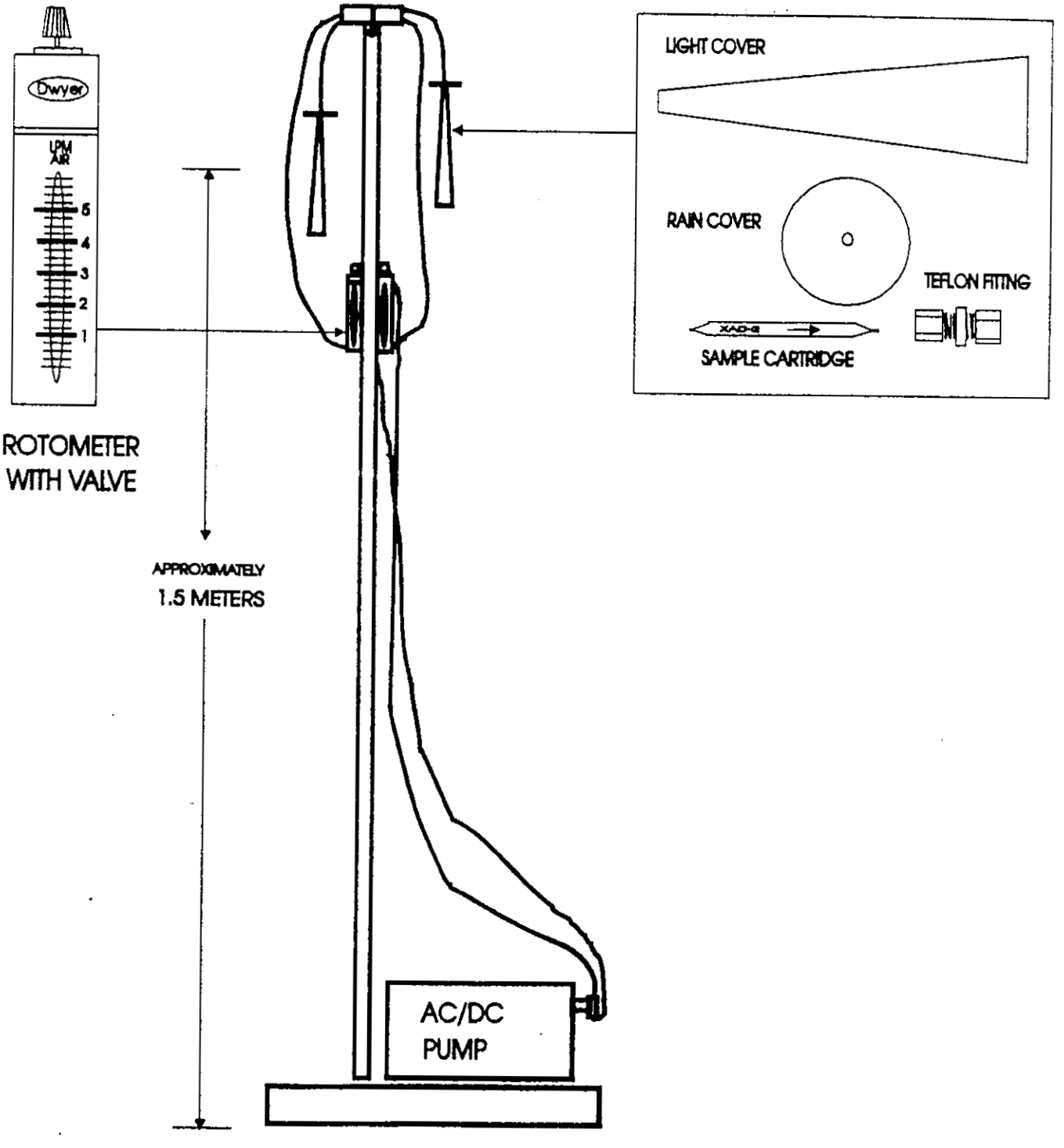
5) A Trip blank will be obtained.

The instrument dependent parameters (reproducibility, linearity and minimum detection limit) will be checked prior to analysis. A chain of custody sheet will accompany all samples. Flow controllers will be calibrated prior to and after sampling in the field.

VII. Personnel

ARB personnel will consist of Kevin Mongar (Project Engineer) and Instrument Technicians from the Testing Section of ARB.

FIGURE 1. SAMPLE TREE



APPENDIX II

LABORATORY REPORT

California Environmental Protection Agency

Air Resources Board

Cycloate Method Development and Cycloate Analytical Results for Ambient Monitoring and Application Samples

Evaluation Section
Engineering and Laboratory Branch
Monitoring and Laboratory Division

Prepared by
Robert Okamoto
Air Pollution Specialist

Revised and Approved by
Russell Grace
Manager, Special Analysis Section
E-Mail: rgrace@arb.ca.gov

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Reference: Project Numbers: C99-084 and C99-084A

Cycloate Method Development and Cycloate Analytical Results for Ambient Monitoring and Application Samples.

1.0 INTRODUCTION

The Department of Pesticide Regulation (DPR) requested the Air Resources Board (ARB) to develop an air sampling and analysis method and conduct ambient air and application site monitoring for cycloate. The estimated quantitation limit (EQL) for cycloate is 63.0 ng/sample. ARB staff collected and analyzed cycloate ambient air and application site samples. This report covers method development, analytical results, and quality assurance results. For conformity and simplicity, we assign the same project numbers: C99-084 and C99-084A as used by the Testing Section.

2.0 METHOD DEVELOPMENT AND STANDARD OPERATING PROCEDURE.

2.1 Overview

The method uses XAD2 adsorbent tubes for sample collection. Extraction of the samples is accomplished by sonicating with 3 ml solution of ethyl acetate and acetone (50:50). Analysis of the samples uses high-resolution gas chromatography/mass spectrometry in the selective ion-monitoring mode to maximize sensitivity. The analysis uses atrazine-$^{13}C_3$ as an internal standard to compensate for sample preparation and analytical variability.

2.2 Instrument Reproducibility

Five injections of 4 µl each were made of cycloate standards at three concentrations in order to establish the reproducibility of this instrument (Table 1.)

2.3 Calibration

A five-point calibration curve using a series of standards (25 -- 400ng/ml). The $r^2 = 0.999$.

2.4. Minimum Detection Limit (MDL)

The method follows standard United States Environmental Protection Agency (USEPA) procedures to calculate the MDL. Using the analysis of seven low level matrix spikes (12.5ng/ml), the method detection limit (MDL), and EQL for cycloate were calculated by:

s = the standard deviation of the concentration calculated for the seven replicate spikes.
MDL = (3.14)(s)(extraction volume in ml)

Cycloate: s = 1.33 ng/ml
*MDL = (3.14) *(1.33)(3 ml extraction) = 12.6 ng/sample*
EQL = (5)(MDL) = 63.0 ng/sample

Reported results equal to or greater than the EQL contain three (3) significant figures. This report uses detected (DET) for samples that are below the EQL but greater than or

equal to the MDL. The report uses <MDL for sample results that are less than the MDL.

2.5. Collection and Extraction Efficiency (Recovery)

Six (6) XAD-2 sample tubes were used to demonstrate method recovery. The primary section of three (3) sample tubes were spiked with 125 ng of cycloate standard and three (3) others with 1000 ng. The spiked tubes were then subjected to an airflow of three (3) lpm for 24 hours at ambient temperature (temperature not recorded). A 50:50 mixture of ethyl acetate and acetone was used to extract the primary section of the spiked tubes. All extracts were stored in the freezer until analyzed. The results are below.

Primary Section Cycloate Spike	Mean Percent Recovery	RSD
125 ng	80.7%	10.1%
1000 ng	75.7%	6.78%

2.6. Storage Stability

Staff spiked the primary sections of three (3) tubes, for each week, with cycloate at 125 ng and three (3) tubes at 1000ng for each week of the storage analysis. The spiked tubes were stored at 0^0C and extracted/analyzed on storage weeks 0, 2, 4 and 8. The storage recoveries (average results) and shown below.

8 week Storage Stability Study (Percent storage recoveries)		
Week	125 ng of cycloate	1000 ng of cycloate
0	117%	108%
2	117%	108%
4	135%	127%
8	115%	103%

2.7 Cycloate Temperature Stabililty

The cycloate ethyl acetate:acetone (50:50) extract is stable when stored at 0°C. When allowed to stand at room temperatures of less than 21°C cycloate extract has a limited stability of approximately 24 hours. Cycloate extracts should not be allowed to stand at ambient temperatures above 21 °C because of even shorter stability times. Autosampler runs where samples are at room temprature should be no longer than 24 hours and at a temperature less than 21 °C.

2.8 Breakthrough

The primary sections of three tubes were spiked with 5000 ng/tube then run for 24 hours at three (3) lpm. Analysis of the back-up resin bed did not detect cycloate in any of the tubes.

3.0 AMBIENT AIR MONITORING SAMPLE RESULTS.

Extraction and analysis of all samples was complete within 25 days of receipt. The laboratory received a total of 155 ambient and QA samples for analysis from 9/14/99 to 10/20/99, as well as four trip blanks, four trip spikes, four field spikes and four laboratory spikes.

Samples with log number 4 and 11 were lost during processing. Staff flagged samples with log numbers 121-146 because the dry ice used to cool the samples during shipping evaporated before the laboratory received them.

Table 2 presents the results of the analysis of the cycloate ambient samples. An asterisk to the right of the cycloate amount denotes the results are the average of duplicate analysis. Low ambient field spike recovery compared to other spike recovery may be due to exposure of the ambient field spikes to prolonged high temperature. Cycloated extracts standing at room temperature in the lab exhibited lower recoveries.

4.0 CYCLOATE AMBIENT ANALYTICAL QUALITY CONTROL

4.1 Ambient laboratory solvent blanks

A laboratory solvent blank was analyzed with each of the eight (8) ambient cycloate analytical sample batches. Staff defines a batch as the samples in an automated GC/MS analysis sequence. Table 3 provides the results of the laboratory solvent blanks for the Eight (8) sample batches. All blanks were less than the MDL.

4.2 Ambient laboratory control spikes

Staff ran two laboratory control spikes (LCS) before the analysis of each set of samples. Staff defines a sample set as all the samples that were prepared during the same period. A LCS is a resin cartridge spiked with 300 ng of cycloate. The control sample is prepared and analyzed as described for the samples. LCS recoveries ranged from 83.9% to 117% and the relative difference between samples in each pair ranged from 1.53% to 16.5%. See Table 4.

4.3 Ambient laboratory control blanks

Staff ran a single laboratory control blank (LCB) with each sample set. The LCB sample cartridge is prepared and analyzed as described for the ambient samples. Table 5 contains the LCB results. No results were above the MDL for the LCB's.

4.4 Ambient calibration check samples

Staff ran a single calibration check sample (CCS) after every tenth sample in a analysis batch. Table 6 presents the CCS results. The average CCS percent recovery was 96.0% of the expected cycloate amount with a relative standard deviation of 6.37%.

4.5 Ambient duplicate analysis

Staff performed duplicate analysis on every tenth sample (see Table 7). The relative difference for duplicate pairs is calculated if the value is equal to or greater than the EQL. The relative difference for duplicate pairs ranged from 1.42% to 6.90%.

5.0 AMBIENT FIELD, TRIP, AND LABORATORY SPIKES AND TRIP BLANKS

Four (4) laboratory spikes, four (4) trip spikes and four (4) field spikes were analyzed for the ambient cycloate test.

5.1 Ambient laboratory spikes

Staff spiked four (4) tubes with 300 ng of cycloate on 9/22/99. The samples were stored in the freezer until analyzed on 10/13/99. The laboratory spike results are Table 8. The average percent recovery was 90.5% and the relative standard deviation was 3.63%.

5.2 Ambient trip spikes

Staff spiked four (4) tubes (trip spikes) with 300 ng of cycloate. The trip spike results are in Table 9. The average recovery was 92.7% and the relative standard deviation was 4.98%.

5.3 Ambient field spikes

Staff spiked four (4) tubes, for use as field spikes, with 300 ng of cycloate on 9/22/99. Collection of the field spike and a collocated sample (unspiked) occurred concurrently. The field backgrounds were found to be at levels between the MDL and the RQL. Thus, the recovery is determined by subtracting the backgrounds from the field spikes. Since only a range of concentrations can be reported in the background, only a recovery range can be reported for the field spike. The cycloate field spike recovery range was from a low of 37.7% to a high of 78.1%. The field spike results are in Table 10.

5.4 Ambient trip blanks

Staff collected four (4) trip blanks, one for each week of ambient monitoring (Table 11).

6.0 APPLICATION SAMPLE RESULTS.

6.1 Application Samples

Staff collected seventy-six (76) application samples along with four (4) field spikes, four (4) trip spikes, four laboratory spikes, and one (1) trip blank. Analysis was complete within four days of sample receipt. Table 12 presents the results of the analysis of the cycloate application samples.

7.0 CYCLOATE APPLICATION ANALYTICAL QUALITY CONTROL

Two laboratory control spikes and a laboratory control blank were prepared with each batch of samples. Before beginning analysis of a batch, staff ran a laboratory solvent blank and a multi-point calibration. Staff ran calibration check samples and duplicates for each sample batch. Additional QC included field spikes, trip spikes, laboratory spikes, and trip blanks.

7.1 Application laboratory solvent blanks

Staff ran a laboratory solvent blank before the analysis of an analytical sample batch. There were five (5) analytical application batches. Table 13 provides the results of the laboratory solvent blanks for the five (5) sample batches. All solvent blanks were less than the MDL.

7.2 Application laboratory control spikes

Each sample set included two (2) laboratory control spikes (LCS) at 300 ng. The LCS is prepared and analyzed the same way as the samples. Staff made an error when spiking the LCS samples 43 and 44. Staff accidentally spiked LCS 43 with twice the amount of cycloate. LCS 44 was not spiked. The recovery for LCS 43 was 211% and the recovery for LCS 44 was <MDL. This value is consistent with an accidental spiking. Since the average recovery of both control samples equaled 106% of the total amount spiked for two LCS samples the LCS were assumed to be in control and no further LCS were run. See Table 14.

7.3 Application laboratory control blanks

A single laboratory control blank (LCB) is run with the analysis of each sample set. The LCB blank sample cartridge is prepared and analyzed in the same manner as the samples. See Table 15.

7.4 Application calibration check samples

Each analytical batch included calibration check samples (CCS). Staff ran a CCS after every tenth sample in a sample batch. This allows staff to ensure the instrument drift does not exceed 20%. The average CCS percent recovery was 96.4% of the expected cycloate amount with a relative standard deviation of 8.50%. See Table 16.

7.5 Application duplicate analysis

Analysis of a sample batch included a duplicate on every tenth (10) sample. Relative difference was calculated on duplicate pairs when the values were at or higher than the EQL. The percent difference ranged from 1.19% to 8.00% with all but one duplicate pair less than 5% difference. See Table 17.

8.0 APPLICATION FIELD, TRIP, AND LABORATORY SPIKES AND TRIP BLANKS

Four (4) laboratory spikes, four (4) trip spikes and four (4) field spikes were analyzed for the cycloate application test.

8.1 Application laboratory spikes

Staff prepared four (4) 600 ng laboratory spikes on 9/22/99 and stored these at 0°C until analysis on 11/3/99. The average percent recovery was 104% and the relative standard deviation was 4.59%. See Table 18.

8.2 Application trip spikes

On 9/22/99, staff spiked four (4) samples as trip spikes with 300 ng of cycloate. Trip spikes accompanied samples to the sampling site. These trip spikes returned to the laboratory along with the samples. Analysis of the trip spikes occurred on 11/1/99. The average recovery was 96.3% and the relative standard deviation was 9.15%. See Table 19.

8.3 Application field spikes

Staff prepared a series of four (4) 300 ng field spikes on 9/22/99. At the sampling site, the spikes are treated in the same manner as a standard sample. A collocated sample ran concurrently with each field spike. The average recovery of the field spikes was 87.1% with a relative standard deviation of 8.40%. See Table 20.

8.4 Application trip blanks

One (1) application trip blank, TB, was analyzed. Cycloate was less than the MDL.

8.5 Backup resin analysis.

Staff evaluated the backup resin beds of four ambient samples with the highest ambient cycloate levels for breakthrough. No cycloate was above background in any of the backup resin beds. See Table 21.

TABLE 1: Instrument Reproducibility

Atrazine-$^{13}C_3$ Amt. (ng/ml)	Atrazine-$^{13}C_3$ Response	Cycloate Amt. (ng/ml)	Cycloate Response	Amt. Ratio	Resp Ratio	Response Ratio RSD
100	601	25	468	0.250	0.779	
100	590	25	452	0.250	0.766	
100	614	25	482	0.250	0.785	
100	587	25	476	0.250	0.811	
100	583	25	437	0.250	0.750	2.92
100	682	100	2116	1.00	3.10	
100	661	100	1989	1.00	3.01	
100	642	100	2026	1.00	3.16	
100	658	100	2042	1.00	3.10	
100	620	100	2067	1.00	3.33	3.79
100	983	400	11114	4.00	11.3	
100	823	400	9530	4.00	11.6	
100	837	400	9325	4.00	11.1	
100	835	400	9563	4.00	11.5	
100	1043	400	11449	4.00	11.0	2.26

Note: Response Ratio = (2.89)(Amt Ratio) - 0.00152*

Table 2: Ambient Air Monitoring Results

Log ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
1	990914	MES1	990915	<MDL
2	990914	MES1D	990915	<MDL
3	990914	WES1	990915	<MDL
5	990914	ELC1	990915	<MDL
6	990914	ELC1D	990916	<MDL
7	990914	HFD1*	990916	<MDL
8	990914	HFD1D	990916	<MDL
9	990914	CLX1	990916	<MDL
10	990914	CLX1DA	990916	<MDL
12	990914	CLX1DC	990916	<MDL
13	990914	MES2	990916	Det
14	990914	WES2	990916	<MDL
15	990914	ELC2	990916	<MDL
16	990914	HFD2	990916	<MDL
17	990914	CLX2*	990916	<MDL
18	990914	CLX2D	990920	<MDL
19	990914	MES3	990920	<MDL
20	990914	MES3D	990920	<MDL
21	990914	WES3	990920	163
22	990914	WES3D	990920	158
23	990914	ELC3	990920	79.7
24	990914	ELC3D	990920	80.7
25	990914	HFD3	990920	<MDL
26	990914	HFD3D	990920	<MDL
27	990914	CLX3*	990920	<MDL
28	990914	CLX3DA*	990920	<MDL
29	990914	CLX3DB	990920	<MDL
30	990914	CLX3DC	990920	<MDL

Log ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
31	990914	MES4	990920	Det
32	990914	WES4	990920	Det
33	990914	ELC4	990921	71.7
34	990914	HFD4	990921	175
35	990914	CLX4	990921	<MDL
36	990921	MES5	990922	113
37	990921	WES5	990922	Det
38	990921	ELC5	990922	<MDL
39	990921	HFD5	990922	<MDL
40	990921	CLX5	990922	Det
41	990921	MES6	990922	Det
42	990921	WES6*	990923	Det
43	990921	ELC6	990923	<MDL
44	990921	HFD6	990923	<MDL
45	990921	CLX6	990923	Det
46	990921	MES7	990923	72.9
47	990921	MES7D	990923	75.4
48	990921	WES7	990923	87.1
49	990921	WES7D*	990923	105
50	990921	ELC7	990923	<MDL
51	990921	ELC7D	990923	<MDL
52	990921	HFD7	990923	Det
53	990921	HFD7D	990923	Det
54	990921	CLX7	990923	Det
55	990921	CLX7D	990923	Det
56	990921	TRIP BLANK	990923	<MDL
57	990921	MES8	990923	Det
58	990921	WES8	9/23/99	Det

Log ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
59	990921	ELC8	990923	Det
60	990921	HF08	990923	224
61	990921	CLX8	990923	<MDL
62	990928	MES9	991004	116
63	990928	WES9	991004	131
64	990928	ELC9	991004	Det
65	990928	HFD9	991004	545
66	990928	CLX9	991004	Det
67	990928	MES10	991004	141
68	990928	WES10*	991004	93.8
69	990928	ELC10	991004	Det
70	990928	HFD10	991004	113
71	990928	CLX10	991004	Det
72	990928	TRIP BLANK	991005	<MDL
73	990928	MES11	991004	<MDL
74	990928	MES11D	991005	73.0
75	990928	WES11	991004	102
76	990928	WES11D*	991005	102
77	990928	ELC11	991005	Det
78	990928	ELC11D	991005	Det
79	990928	HFD11	991005	695
80	990928	HFD11D	991005	964
81	990928	CLX11	991005	371
82	990928	CLX11D	991005	397
83	990928	MES12	991005	80.9
84	990928	WES12	991005	81.9
85	990928	ELC12	991005	74.2
86	990928	HFD12	991005	142

Log ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
87	990928	CLX12*	991005	74.1
88	991005	MES13	991006	Det
89	991005	WES13	991005	Det
90	991005	ELC13	991005	Det
91	991005	HFD13	991005	120
92	991005	CLX13	991005	Det
93	991005	MES14	991005	Det
94	991005	WES14*	991005	Det
95	991005	ELC14	991005	<MDL
96	991005	HFD14	991005	Det
97	991005	CLX14	991005	Det
98	991005	CAF922-1	991005	247
99	991005	CAF922-2	991005	220
100	991005	CAT922-1	991005	299
101	991005	CAT922-2	991005	273
102	991005	MES15	991005	Det
103	991005	MES15D	991005	Det
104	991005	WES15	991005	Det
105	991005	WES15D*	991005	Det
106	991005	ELC15	991005	<MDL
107	991005	ELC15D	991005	<MDL
108	991005	HFD15	991005	Det
109	991005	HFD15D	991005	Det
110	991005	CLX15	991005	Det
111	991005	CLX15D	991005	Det
112	991005	CAF922-3*	991007/ & 991013	176
113	991005	CAF922-4	991013	200

Log ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
114	991005	CAT922-3	991013	272
115	991005	CAT922-4	991013	269
116	991005	MES16	991007	Det
117	991005	WES16	991007	Det
118	991005	ELC16	991007	Det
119	991005	HFD16	991007	Det
120	991005	CLX16	991007	Det
121	991015	MES17	991104	<MDL
122	991015	WES17	991104	<MDL
123	991015	ELC17	991104	<MDL
124	991015	HFD17	991104	Det
125	991015	CLX17	991104	Det
126	991015	MES18	991104	Det
127	991015	WES18*	991104	<MDL
128	991015	ELC18	991108	<MDL
129	991015	HFD18	991108	<MDL
130	991015	CLX18	991108	<MDL
131	991015	MES19	991108	<MDL
132	991015	MES19D	991108	<MDL
133	991015	WES19	991108	Det
134	991015	WES19D*	991108	Det
135	991015	ELC19	991108	<MDL
136	991015	ELC19D	991109	<MDL
137	991015	HFD19	991108	<MDL
138	991015	HFD19D	991109	<MDL
139	991015	CLX19	991108	<MDL
140	991015	CLX19D	991109	<MDL
141	991015	TB-4*	991109	<MDL

Log ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
142	991015	MES20	991109	<MDL
143	991015	WES20	991109	Det
144	991015	ELC20	991109	<MDL
145	991015	HFD20	991109	<MDL
146	991015	CLX20	991109	<MDL
147	991020	MES21	991109	Det
148	991020	WES21	991109	153
149	991020	ELC21	991109	<MDL
150	991020	HFD21	991109	68.7
151	991020	CLX21	991109	<MDL
152	991020	MES22	991109	<MDL
153	991020	MES22D	991110	Det
154	991020	WES22*	991109	Det
155	991020	WES22D*	991110	Det
156	991020	ELC22	991109	<MDL
157	991020	ELC22D	991110	<MDL
158	991020	HFD22	991109	Det
159	991020	HFD22D	991110	64.3
160	991020	CLX22	991109	Det
161	991020	CLX22D	991110	Det
162	991020	TB-5	991110	<MDL
163	991020	MES23	991109	<MDL
164	991020	WES23	991109	<MDL
165	991020	ELC23	991109	<MDL
166	991020	HFD23	991109	Det
167	991020	CLX23	991110	<MDL

Table Two Notes:

*Average of two analyses

If analysis result is ≥MDL and < EQL it is reported in the table as detected (DET). Levels ≥EQL of 63.0 ng/sample are reported as the actual measured value and were reported to three significant figures.

<MDL = Cycloate less than 12.6 ng/sample
Det = Cycloate amount ≥12.6 ng/sample and < 63.0 ng/sample. (EQL)

Log ID samples 4 and 11 were lost during processing.

Table 3: Ambient Laboratory solvent blanks

Sample Name	Date	Cycloate (ng/sample)
B9091501	9/15/99	[1]<MDL
B9092001	9/20/99	<MDL
B9092201	9/22/99	<MDL
B9093001	9/30/99	<MDL
B9101301	10/13/99	<MDL
B9110301	11/3/99	<MDL
B9110801	11/8/99	<MDL
B9110901	11/9/99	<MDL

[1]<MDL = Amount less than 12.6 ng/sample.

Table 4: Ambient Laboratory Control Spike Results

Sample Name	Date Analyzed	Cycloate Amount (ng/sample)	Cycloate Expected (ng/sample)	Percent Recovery	Relative difference
LCS-35	9/15/99	286	300	95.3	
LCS-36	9/15/99	292	300	97.3	2.07%
LCS37	9/22/99	271	300	90.2	
LCS38	9/22/99	266	300	88.7	1.77%
LCS39	9/30/99	311	300	104%	
LCS40	9/30/99	326	300	109%	4.74%
LCS39	10/4/99	333	300	111%	
LCS40	10/4/99	350	300	117%	4.98%
LCS41	10/6/99	297	300	99.0%	
LCS42	10/6/99	252	300	83.9%	16.5%
LCS45	11/4/99	326	300	109%	
LCS46	11/4/99	321	300	107%	1.53%
LCS47	11/9/99	342	300	114%	
LCS48	11/9/99	332	300	111%	2.77%

Relative Difference = 100*(sample1-sample2)/average

Table 5: Ambient Laboratory Control Blank Results

Sample Name	Date Analyzed	Cycloate Amount (ng/sample)
LCB-18	9/15/99	<MDL*
LCB19	9/22/99	<MDL
LCB20	9/30/99	<MDL
LCB21	10/6/99	<MDL
LCB23	11/4/99	<MDL
LCB24	11/9/99	<MDL

[1]<MDL=Amount less than 12.6 ng/sample
DET = Amount greater than or equal to 12.6 ng/sample but less than 63.0 ng/sample

Table 6: Ambient Calibration Check Sample Results

Sample Name	Date Run	Cycloate Amount (ng/sample)	Cycloate Expected (ng/sample)	Percent Recovery
CC909151	9/16/99	313	300	104%
CC909152	9/16/99	301	300	100%
CC909201	9/20/99	302	300	101%
CC909202	9/21/99	265	300	88.6%
CC909221	9/23/99	301	300	100%
CC909222	9/23/99	297	300	98.9%
CC909223	9/23/99	303	300	101%
CC910041	10/4/99	320	300	107%
CC910022	10/5/99	274	300	91.3%
CC910023	10/5/99	284	300	94.7%
CC910061	10/7/99	278	300	92.8%
CC910062	10/7/99	249	300	83.1%
CC910063	10/7/99	245	300	81.7%
CC910131	10/13/99	300	300	99.9%
CC910132	10/13/99	290	300	96.6%
CC911031	11/4/99	296	300	98.5%
CC911032	11/4/99	284	300	94.7%
CC911081	11/8/99	300	300	99.9%
CC911082	11/9/99	279	300	92.9%
CC911091	11/9/99	286	300	95.4%
CC911092	11/10/99	282	300	94.1%
CC911093	11/10/99	290	300	96.8%

Table 7: Ambient Duplicate analysis results (ng/sample)

Sample Name	Cycloate Amount	Average	Relative Difference
HFD-1	<MDL[1]		
HFD-1	<MDL	NQ[3]	NC[4]
CLX-2	<MDL		
CLX-2	<MDL	NQ	NC
CLX-3	<MDL		
CLX-3	<MDL	NQ	NC
WES-6	DET[2]		
WES-6	DET	NQ	NC
WES-7D	104		
WES-7D	106	1.05E+2	1.42%
WES-10	923		
WES-10	652	9.38E+2	3.06%
WES-11D	985		
WES-11D	106	1.02E+2	6.90%
WES-14	DET		
WES-14	DET	NQ	NC
WES-15D	DET		
WES-15D	DET	NQ	NC
TB-4	<MDL		
TB-4	<MDL	NQ	NC
CAL922-2	287		
CAL922-2	278	2.83E+2	3.27%
WES-18	<MDL		
WES-18	<MDL	NQ	NC
WES-19D	DET		
WES-19D	DET	NQ	NC
WES-22	DET		
WES-22	DET	NQ	NC
WES-23D	DET		
WES-23D	DET	NQ	NC

[1]MDL<12.6 ng/sample
[2]DET= ≥12.6 ng/sample but < 63.0 ng/sample
[3]NQ= not quantitated
[4]NC= not calculated
Relative Difference = 100*(analysis1-analysis2)/average

Table 8: Ambient Laboratory Spikes Results

Sample Name	Date Spiked	Date Analyzed	Cycloate Amount (ng/sample)	Amount Cycloate Spiked (ng/sample)	Percent Recovery
CAL922-1	9/22/99	10/13/99	276	300	92.1%
CAL922-2	9/22/99	10/13/99	283	300	94.2%
CAL922-3	9/22/99	10/13/99	261	300	87.0%
CAL922-4	9/22/99	10/13/99	266	300	88.6%

Table 9: Ambient Trip Spike Results

Sample Name	Date Spiked	Date Analyzed	Cycloate Amount (ng/sample)	Amount Cycloate Spiked (ng/sample)	Percent Recovery
CAT922	9/22/99	10/13/99	299	300	99.5%
CAT922	9/22/99	10/13/99	273	300	91.1%
CAT922	9/22/99	10/13/99	272	300	90.5%
CAT922	9/22/99	10/13/99	269	300	89.5%

Table 10: Ambient Field Spike Results

Sample Name	Collocated sample ID	Date Analyzed	Cycloate Amount in Sample (ng/sample)	Amount Cycloate in collocated sample (ng/sample)	Percent Recovery
CAF922-1	CLX14	10/13/99	248	DET	68.4 – 78.1%
CAF922-2	CLX14	10/13/99	220	DET	52.3 – 69.0%
CAF922-3*	CLX15/15D	10/13/99	176	DET	37.7 – 54.4%
CAF922-4	CLX15/15D	10/13/99	200	DET	48.8 – 62.5%

<MDL = Amount less than 12.6 ng/sample
CLX15/15D = Collocated samples CLX15 and CLX15D
The range of recovery was determined by subtracting the MDL and the RQL from the spiked sample.

Table 11: Ambient Trip Blank Results

Sample Name	Date Analyzed	Cycloate Amount (ng/sample)
TB-1	09/23/99	<MDL[1]
TB-2	10/05/99	<MDL
TS-3*	11/09/99	<MDL
TS-4	11/10/99	<MDL

[1]<MDL=Amount less than 12.6 ng/sample
* Average of two analyses.

Table 12: Application Air Monitoring Results

LOG ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
1	10/12/99	N2B	10/20/99	<MDL
2	10/12/99	N2FS1	10/20/99	579
3	10/12/99	N3B	10/20/99	<MDL
4	10/12/99	N3F3	10/20/99	512
5	10/12/99	S2B	10/20/99	<MDL
6	10/12/99	S2F3	10/20/99	472
7	10/12/99	S3B	10/20/99	<MDL
8	10/12/99	S3F4	10/20/99	527
9	10/12/99	N11	10/20/99	69.5
10	10/12/99	N21*	10/20/99	<MDL
11	10/12/99	N31	10/20/99	<MDL
12	10/12/99	N41	10/20/99	<MDL
13	10/12/99	S11	10/20/99	<MDL
14	10/12/99	S21	10/20/99	<MDL
15	10/12/99	S31	10/20/99	<MDL
16	10/12/99	S31D	10/20/99	<MDL
17	10/12/99	S41	10/20/99	<MDL
18	10/12/99	N12	10/20/99	Det
19	10/12/99	N22	10/20/99	<MDL
20	10/12/99	N32*	10/20/99	<MDL
21	10/12/99	N42	10/26/99	<MDL
22	10/12/99	S12	10/26/99	<MDL
23	10/12/99	S22	10/26/99	<MDL
24	10/12/99	S32	10/26/99	Det
25	10/12/99	S32D	10/26/99	Det
26	10/12/99	S42	10/26/99	67.4
27	10/12/99	N13	10/26/99	<MDL
28	10/12/99	N23	10/26/99	<MDL
29	10/12/99	N33	10/26/99	<MDL
30	10/12/99	N43*	10/26/99	<MDL
31	10/12/99	S13	10/27/99	<MDL
32	10/12/99	S23	10/27/99	895
33	10/12/99	S33	10/27/99	520
34	10/12/99	S33D	10/27/99	519
35	10/12/99	S43	10/27/99	Det
36	10/12/99	N14	10/27/99	Det
37	10/12/99	N24	10/27/99	Det
38	10/12/99	N34	10/27/99	Det
39	10/12/99	N44	10/27/99	Det
40	10/12/99	S14	10/27/99	Det
41	10/12/99	S24*	10/27/99	120
42	10/12/99	S34	10/28/99	384
43	10/12/99	S34D	10/28/99	398
44	10/12/99	S44	10/28/99	102
45	10/12/99	N15	10/28/99	<MDL
46	10/12/99	N25	10/28/99	<MDL
47	10/12/99	N35	10/28/99	<MDL
48	10/12/99	N45	10/28/99	<MDL
49	10/12/99	S15	10/28/99	Det
50	10/12/99	S25	10/28/99	109
51	10/12/99	S35*	10/28/99	71.6
52	10/12/99	S35D	10/28/99	Det

LOG ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
53	10/12/99	S45	10/28/99	76.5
54	10/12/99	N16	10/28/99	<MDL
55	10/12/99	N26	10/28/99	<MDL
56	10/12/99	N36	10/28/99	Det
57	10/12/99	N46	10/28/99	<MDL
58	10/12/99	S16	10/28/99	Det
59	10/12/99	S26	10/28/99	<MDL
60	10/12/99	S36	10/28/99	<MDL
61	10/12/99	S36D	10/28/99	<MDL
62	10/12/99	S46*	10/28/99	<MDL
63	10/12/99	TB	11/1/99	<MDL
64	10/12/99	TS1	11/1/99	504
65	10/12/99	TS2	11/1/99	622
66	10/12/99	TS3	11/1/99	608
67	10/12/99	TS4	11/1/99	577
68	10/12/99	N17	11/1/99	Det
69	10/12/99	N27	11/1/99	<MDL
70	10/12/99	N37	11/1/99	Det
71	10/12/99	N47	11/1/99	Det
72	10/12/99	S17	11/1/99	Det
73	10/12/99	S27*	11/1/99	Det
74	10/12/99	S37	11/1/99	Det
75	10/12/99	S7D	11/1/99	Det
76	10/12/99	S47	11/1/99	Det
77	10/12/99	N18	11/1/99	Det
78	10/12/99	N28	11/1/99	Det
79	10/12/99	N38	11/1/99	<MDL
80	10/12/99	N48	11/1/99	Det

LOG ID	Date Received	Sample Name	Analysis Date	ng/sample cycloate
81	10/12/99	S18	11/1/99	Det
82	10/12/99	S28	11/1/99	Det
83	10/12/99	S38*	11/3/99	Det
84	10/12/99	S38D	11/3/99	Det
85	10/12/99	S48	11/3/99	Det
		LS1	11/3/99	635
		LS2	11/3/99	642
		LS3	11/3/99	580
		LS4*	11/3/99	634

*Average of two analyses

If analytical results is $\geq$ MDL and < EQL it is reported in the table as detected (DET). Levels equal to or greater than the EQL of 63.0 ng/sample are reported as the actual measured value and were reported to three significant figures.

<MDL = Cycloate less than 12.6 ng/sample
Det = Cycloate amount equal to or greater than 12.6 ng/sample and less than 63.0 ng/sample. (EQL).

Table 13: Application Laboratory solvent blanks

Sample Name	Date	Cycloate Amount (ng/sample)
B9102001	10/20/99	<MDL
B9102601	10/20/99	<MDL
B9102801	10/20/99	<MDL
B9110101	11/1/99	<MDL
B9110301	11/3/99	<MDL

[1]DET = Amount ≥12.6 ng/sample and <63.0 ng/sample

Table 14: Application Laboratory Control Spike Results

Sample Name	Date Analyzed	Cycloate Amount (ng/sample)	Cycloate Expected (ng/sample)	Percent Recovery	Relative difference
LCS43	11/3/99	634	300	211%	NC
LCS44	11/3/99	<MDL	300	NC	NC

Relative Difference = 100*(sample1-sample2)/average
NC = Not calculated

Table 15: Application Laboratory Control Blank Results

Sample Name	Date Analyzed	Cycloate Amount (ng/sample)
LCB22	11/3/99	<MDL*

*<MDL = Amount < 12.6 ng/sample

Table 16: Application Calibration Check Sample Results

Sample Name	Date Run	Cycloate Amount (ng/sample)	Cycloate Expected (ng/sample)	Percent Recovery
CC910201	10/20/99	272	300	90.8%
CC910202	10/21/99	278	300	92.6%
CC912601	10/27/99	284	300	94.6%
CC910262	10/28/99	242	300	80.7%
CC910281	10/28/99	304	300	101%
CC910282	10/29/99	288	300	96.1%
CC911011	11/1/99	328	300	109%
CC911012	11/1/99	310	300	103%
CC911031	11/4/99	296	300	98.5%

Table 17: Application Duplicate analysis results

Sample Name	Cycloate Amount (ng/sample)	Average (ng/sample)	Relative Difference
N21	<MDL		
N21	<MDL	NC	ND
N32	<MDL		
N32	<MDL	NC	ND
N43	<MDL		
N43	<MDL	NC	ND
S24	119		
S24	121	120	1.52%
S35	70.7		
S35	72.6	71.6	2.64%
S46	<MDL		
S46	<MDL	NC	ND
S17	DET		
S17	DET	NC	ND
S28	DET		
S28	DET	NC	ND
LS4	634		
LS4	635	634	0.194%

Relative Difference = 100*(analysis1-analysis2)/average

Table 18: Application Laboratory Spikes Results

Sample Name	Date Spiked	Date Analyzed	Cycloate Amount (ng/sample)	Amount Cycloate Spiked (ng/sample)	Percent Recovery
LS-1	9/22/99	11/3/99	635	600	106%
LS-2	9/22/99	11/3/99	642	600	107%
LS-3	9/22/99	11/3/99	580	600	96.7%
LS-4	9/22/99	11/3/99	634	600	106%

Table 19: Application Trip Spike Results

Sample Name	Date Spiked	Date Analyzed	Cycloate Amount (ng/sample)	Amount Cycloate Spiked (ng/sample)	Percent Recovery
TS-1	9/22/99	11/1/99	504	600	83.9%
TS-2	9/22/99	11/1/99	622	600	104%
TS-3	9/22/99	11/1/99	606	600	101%
TS-4	9/22/99	11/1/99	577	600	96.1%

Table 20: Application Field Spike Results

Sample Name	Collocated Application Sample	Date Analyzed	Cycloate Amount (ng/sample)	Amount Cycloate in collocated sample (ng/sample)	Percent Recovery
N2F1	N2B	10/20/99	579	<MDL	96.4%
N3F3	N3B	10/20/99	512	<MDL	85.4%
S2F3	S2B	10/20/99	472	<MDL	78.7%
S3F4	S3B	10/20/99	527	<MDL	87.8%

Note: Field spikes were spiked with 600 ng/sample.

Table 21: Backup Resin Results

Sample Name	Cycloate Amount (ng/sample)
HFD9-B	<MDL*
HFD11-B	<MDL
HFD11D-B	<MDL
CLX11-B	<MDL

*<MDL = Amount $\leq$ 12.6 ng/sample

Appendix I: Standard Operating Procedure for Cycloate

Cycloate Method Development and Cycloate Analytical Results for Ambient Monitoring and Application Samples

Evaluation Section
Engineering and Laboratory Branch
Monitoring and Laboratory Division

Standard Operating Procedure
Sampling and Analysis of Cycloate in Ambient Air

3//2000 Version

Approved
Michael P. Spears, Manager

Standard Operating Procedure: Sampling and Analysis of Cycloate in Ambient Air

1. SCOPE:

This is an adsorbent tube, solvent extraction, gas chromatography/mass spectrometry method for the determination of cycloate from ambient air samples.

2. SUMMARY OF METHOD:

The exposed XAD-2 resin tubes (SKC #226-30-06) are stored in an ice chest on dry ice or freezer until desorbed during by sonication in 3.0 ml of 50:50 ethyl acetate/acetone. An aliquat of extract is spiked with 30ng of atrazine-$^{13}C_3$ prior to injection. The splitless injection volume is 1 µl. A gas chromatograph with a capillary column (95% methyl 5% phenyl silicone stationary phase) and a quadrapole mass spectrometer (MS) is used for analysis. The MS detector is operated in selected ion monitoring mode.

3. INTERFERENCES/LIMITATIONS:

Method interferences may be caused by contaminants in solvents, reagents, glassware and other processing apparatus that can lead to discrete artifacts or elevated baselines. Co-eluting compounds trapped during sample collection may also interfere. A method blank must be done with each batch of samples to detect any possible method interferences.

4. EQUIPMENT AND CONDITIONS:

A. INSTRUMENTATION:

Hewlett Packard 6890 chromatograph
Hewlett Packard 5973 mass selective detector
Hewlett Packard 7683 Autosampler

Detector: 280°C
Injector: 225°C
Injector Liner: Goose neck liner with glass wool
Column: J&W DB-5MS, 30 meter, 0.25 mm i.d., 0.25 um film thickness.

Pre-column: Restek deactivated fused silica, 2 meter, 0.25 mm i.d.

GC Temp. Program: Initial 50°C, hold 3 min., to 300°C @ 15°C/min

Injector:
Pressure Initial 9.5 psi constant flow mode
Splitless: Purge on 2.0 min.
Carrier Gas: Helium
Column: Linear velocity: 38 cm/sec, electronic pressure control (9.5 psi @ 50 °C).

Auto Sampler:
Sample washes - 1, Sample pumps - 4, Sample Volume - 4 stops, Viscosity delay - 0 sec, Solvent A washes - 4, Solvent B washes - 4

Mass Spectrometer:
Electron Ionization
Selective Ion Monitoring; cycloate - 154 (quant. ion, 100%), 83 (qual. ion, 100%), 72 (qual. ion, 10%). atrazine-$^{13}C_3$ - 205 (quant. ion, 100%), 220 (qual. ion, 40%),
Tuning: PFTBA

B. AUXILIARY APPARATUS:

1. Glass amber vials, 8 mL capacity.
2. Vial Shaker, SKC, or equiv.
3. Sonicator, Branson 2210
4. Autosampler vials with septum caps.

C. REAGENTS

1. Ethyl Acetate, Pesticide Grade or better
2. Acetone, Pesticide Grade or better
3. Cycloate 99.2% pure or better (e.g., from Chem Service).
4. Atrazine-$^{13}C_3$ 99% pure or better (e.g., from Cambridge Isotope Laboratories)

5. ANALYSIS OF SAMPLES

A. A daily manual tune shall be performed using PFTBA. The instrument is tuned using masses - 69, 219, 502. The criterion for the tune are the peak widths at 1/2 the peak height, 0.50 $\pm$ .05, and the criteria for relative abundance; 69:100%; 219:100% to 120%, and 502:6%-11%.

B. It is necessary to analyze a solvent blank with each batch of samples. Staff defines a batch as the samples in an automated GC/MS analysis sequence. The blank must be free of interferences. A solvent blank must be analyzed after any sample, which results in possible carry-over contamination.

C. Perform a 5-point calibration with each batch of samples.

D. A laboratory control blank and two laboratory control spike samples will be run with each set of samples. A set of samples is a group of samples prepared during the same time period. A laboratory control blank is a blank resin cartridge prepared and analyzed the same way the samples are analyzed. A laboratory control spike is a resin cartridge spiked with a known amount of standard. The control sample is prepared and analyzed the same way as the samples. Laboratory control spike samples need to be within 40% (100*difference/average) of each other and have recoveries that are +/- 30% of the theoretical spiked value.

E. At least one calibration check sample must be analyzed for each batch of 10 samples analyzed. The response of the standard must be within 20% of the initial calibration analyses for the batch. If the calibration check is outside the limit then those samples in the batch after the last calibration check that was within the 20% limit need to be reanalyzed.

F. Carefully score the secondary section end of the sampled XAD-2 tube above the glasswool and break at the score. Remove the glass wool plug from the secondary end of the XAD-2 tube with forceps and place it into a 4 mL amber colored sample vial. Pour the backup portion of the XAD-2 into the same vial. Remove the middle glass wool plug and store in the 4 mls amber vial. Retain the secondary section of the XAD-2 tube for later analysis if needed to check the possibility of breakthrough.

G. Pour the primary XAD into an 8-mL vial. Remove the glasswool plug from the tube and put into the 8 ml vial. Carefully rinse the inside of the tube with 3.0 mls of a 50:50 (vol) solution of ethyl acetate and acetone and pour the rinse into the 8 ml vial.

H. Place the sample vial on a desorption shaker (or ultra sonic water-bath) for 30 minutes. Remove vial and store at -20°C until analysis. Transfer an 285 µl aliquot to a GC autosample vial. Then add 15 µl of 20 ug/ml Atrazine-$^{13}C_3$ recovery standard to the GC autosample vial prior to analysis.

I. Place the sample vial on a desorption shaker (or ultra sonic water-bath) for 30 minutes. Remove vial and store at -20°C until analysis. Transfer an 285 µl aliquot to a GC autosample vial. Then add 15 µl of 20 ug/ml Atrazine-$^{13}C_3$ recovery standard to the GC autosample vial prior to analysis.

J. After calibration of the GC system, inject 1.0 µL of the extract. If the resultant peak for cycloate has a measured concentration greater than that of the highest standard injected, dilute the sample and re-inject.

K. Calculate the concentration in ng/ml based on the data system calibration curve. If the sample has been diluted, multiply the calculated concentration by the dilution factor.

L. The atmospheric concentration is calculated according to:

Conc., ng/m^3 = (Extract Conc., ng/mL X 3.0 mL) /Air Volume Sampled, m^3

6. QUALITY ASSURANCE

A. INSTRUMENT REPRODUCIBILITY

Five (5) injections of 1 µl each were made of cycloate standards at three concentrations in order to establish the reproducibility of this instrument.

B. CALIBRATION

Linearity

A linear regression was performed on a 25 ng/ml to 400ng/ml 5-point calibration.

Resp Ratio = (2.89)*Amt - 0.00152, R^2 = 0.999

Calibration Check: A calibration check sample is run after every tenth sample in a batch to verify the system is still in calibration. Calibration check samples must be within 20% of the assigned value. If the check sample is outside that range then the ten samples within that sample batch will be rerun.

C. MINIMUM DETECTION LIMIT

The method follows standard United States Environmental Protection Agency (USEPA) procedures to calculate the MDL. Using the analysis of seven low level matrix spikes (12.ng/ml), the method detection limit (MDL), and the estimated quantitation limit (EQL) for cycloate were calculated by:

s = the standard deviation of the concentration calculated for the seven replicate spikes.
MDL =(3.14)(s)(extraction volume in ml)

Cycloate: s= 1.33
MDL = (3.14)(1.33)(3 ml extraction) =12.6 ng/sample
EQL= 5 *12.6 = 63.0 ng/sample

Results equal to or above the EQL are reported to three (3) significant figures.

Results below the EQL but greater than or equal to the MDL are reported as detected (DET). Results less than MDL are reported as <MDL.

The amount of air collected for a 24 hour period with a flow rate of 3 liter per minute is 4.32 m^3. The ambient air concentration at the EQL can be determined by dividing the total sample mass by the total volume of air collected.

(63.0ngs) / (4.32 m^3) = 14.6 ng/m^3 per 24-hour sample

D. COLLECTION AND EXTRACTION EFFICIENCY (RECOVERY)

The primary section of three (3) XAD-2 sampling tubes were spiked with 125 ng of cycloate standard and the primary section of three (3) XAD-2 tubes were spiked with 1000ng of cycloate standard. The spiked tubes were sampled with ambient air at a flowrate of 3 lpm for 24 hours. The primary sections were extracted with a 50:50 mixture of ethyl acetate/acetone and the extracts were stored in the freezer until analyzed. The average percent recoveries from the primary sections spiked with 125 ng of cycloate was 80.7% with a relative standard deviation of 7.57% and the average percent recoveries of the primary sections spiked with1000 ng of cycloate was 94.6%, with a relative standard deviation of 4.26%. A later field study of 5 tubes spiked with cycloate at 300 ngs had an average recovery of 75.7% with a relative standard deviation of 6.78%.

E. STORAGE STABILITY

Storage stability studies were conducted over an 8 week period. The primary sections of twelve (12) tubes were spiked with 125 ng of cycloate. The spiked tubes were stored in the freezer at 0^0C and extracted/analyzed on storage weeks 0, 2, 4 and 8. The storage recoveries (average results) were 117%, 117%, 154%, and 115% for weeks 0, 2, 4, and 8 respectively.

The primary sections of twelve (12) tubes were spiked with with 1000 ng of cycloate. The spiked tubes were stored in the freezer at 0^0C and extracted/analyzed on storage weeks 0, 2, 4 and 8. Three (3) tubes each were analyzed on week 0, 2, 4, and 8. The storage recoveries (average results) were 108%, 108%, 127%, 103% for weeks 0, 2, 4, and 8 respectively.

F. · BREAKTHROUGH

The primary sections of three (3) tubes were spiked with 5000 ng cycloate were run for 24 hours at 3 lpm. No cycloate was detected in the back-up resin bed of any of the tubes.

G. SAFETY

OSHA and NIOSH time weighted average is 5 mg/m^3. This procedure does not address all of the safety concerns associated with the chemical analysis. For more hazard information and guidance the analyst is referred to the material safety data sheets and other appropriate safety material.

APPENDIX III

PESTICIDE USE RECOMMENDATION

Steven Nickus Agricultural Consulting
1085 State Street
El Centro, CA 92243
619/353-0700

SITE ID / DATE

Date: 09/10/99
Recomd No: 13277
Page: 1

Grower / Permittee: **TONY ABATTI FARMS**
Permit No: **13-00-130837A**

Released By:

Date: 08/30/99 Time: :

Location: **ASH 39B**
Block:
Crop: **Sugar Beets**
Crop Acres: **70.00**

Sec:	Twn:	Rng:	Map:
29	16	15	235

Site ID No: **ASH39BW**

N / W / E / S

Environmental Changes - Special Instructions:
DO NOT DRIFT TWARDS HOUSES, CANALS, ROADS, WATERWAYS, OR SURROUNDING AREAS

Pest Control Operator:	Address:	Notified:	Time:
TONY ABATTI FARMS	El Centro		:

Application Date: 10/05/99 TUESDAY
Acres Applied: 70.00

Rate/Treated Acre:	Total Diluent:	Method:	Coverage:
20 GAL	1,400 GAL	Ground	100%

Application Notes:
MULCH & INCORPORATE 24 INCH BAND

Chemical Supplier:	Address:	Notified:	Time:
Stoker Co	Imperial		:

Pest:	Rate/Treated Acre:	Chemical, EPA Number, Active Ingredient:	Total Quantity:
Weeds	3.429	Pt Ro-Neet 6-E, 10182-178, Cycloate	30.00 Gl

Evaluation Criteria

- √ Percent Infestation
- ___ Preventative
- ___ Sweep Counts
- ___ Trap Counts
- N Bloom? (Y/N)
- √ Other mitigation measures have been considered
- √ Economic damage is imminent

Precautions

Highest Category:
Re-entry: 12 Hours
Require Posting: No
Days to Harvest:
Days to Pasture:

Label Warnings and Restrictions

Avoid drift to surrounding areas.
Toxic to bees, birds, fish and wildlife.
Keep out of canals, waterways and ponds.
See label for other restrictions and conditions.

Completion Date: / / Time:

Recommended By: Steven Nickus License No: 6908 File Date: / / Time: :

Agricultural Commissioner: Date: Approved___ Denied___

APPENDIX IV

DPR's
AIR MONITORING RECOMMEDATIONS FOR CYCLOATE

dpr

Department of Pesticide Regulation

Peter M. Rooney
Secretary for Environmental Protection

James W. Wells, Director
830 K Street • Sacramento, California 95814-3510 • www.cdpr.ca.gov

Pete Wilson
Governor

MEMORANDUM

TO: George Lew, Chief
Engineering and Laboratory Branch
Air Resources Board

FROM: Douglas Y. Okumura, Chief
Environmental Monitoring and Pest Management Branch
(916) 324-4100

DATE: September 2, 1998

SUBJECT: CYCLOATE AIR MONITORING

Attached is the Department of Pesticide Regulation's (DPR) recommendation for monitoring the pesticide cycloate. DPR provides this recommendation pursuant to the requirements of the Toxic Air Contaminant Act. DPR bases its air monitoring recommendations on historical cycloate use information. Therefore, we request that you consult with the agricultural commissioner in the county where air monitoring will be conducted to select appropriate sites. We also recommend you contact DPR 30 to 60 days prior to monitoring for updated pesticide use information.

We anticipate submission of air monitoring data by April 2000.

If you have any questions please contact Pam Wales, of my staff, at (916) 322-3877.

Attachments

cc: Pam Wales (TAC Files), w/attachments
Lynn Baker, ARB, w/attachments
Madeline Brattesani, w/attachments
Stephen L. Birdsall, Imperial County Agricultural Commissioner, w/attachments

California Department of Pesticide Regulation
Environmental Monitoring and Pest Management Branch

Staff Report

USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT CYCLOATE

September 1998

Principal Author
Pamela Wales
Environmental Research Scientist

Graphics by
Craig Nordmark
Environmental Research Scientist

State of California
Department of Pesticide Regulation
1020 N Street
Sacramento, California 95814-5624

USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT CYCLOATE

A. BACKGROUND

This recommendation contains general information regarding the physical-chemical properties and the historical uses of cycloate. The Department of Pesticide Regulation (DPR) provides this information to assist the Air Resources Board (ARB) in their selection of appropriate locations for conducting pesticide air monitoring operations.

Table 1 describes some of the physical-chemical properties of cycloate.

Table 1. Physical-Chemical Properties of Cycloate

Chemical name	S-ethyl cyclohexyl(ethyl)thiocarbamate
Common name	Cycloate
Some tradenames	Ro-Neet†
CAS number	1134-23-2
Molecular formula	$C_{11}H_{21}NOS$
Molecular weight	215.37
Form	Colorless liquid with an aromatic odor
Solubility	Water: 9.50×10^{-1} ppm at 25 °C (Kollman and Segawa) Miscible with most organic solvents (Tomlin)
Henry's constant	4.76×10^{-6} atm·m³/mol at 25 °C (Kollman and Segawa)
Vapor pressure	1.60×10^{-3} mmHg at 25 °C (Kollman and Segawa) 6.2×10^{-3} mmHg at 25 °C (Humburg et al.)
Specific gravity	1.10 at 30/4 (Humburg et al.)

Soil-applied cycloate volatilizes readily from moist soil when it is applied to the soil's surface without incorporation. Volatilization does not play a large role in cycloate's loss from dry soils. Microbial breakdown plays a major role in cycloate's disappearance from soils, when cycloate is incorporated to a depth of two to three inches. Cycloate resists leaching in heavy clay and highly organic soils; however, in loamy sand it leached downward three to six inches with application of eight inches of water. Under crop growing conditions, cycloate's reported half-life ranged from four to eight weeks in several soils.

† Ro-Neet® 6-E is a registered product of the Zeneca Ag Products Company, Zeneca Inc, Wilmington, Delaware. *Disclaimer: The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.*

In plants, cycloate is readily taken up by sugarbeet roots and translocated to the stems and leaves. Although not applied to foliar surfaces, cycloate is rapidly absorbed by leaves. Cycloate does not persist in plants. Within three days after treatment, cycloate is rapidly and completely metabolized in sugarbeet roots and foliage to ethyl-cyclohexylamine, carbon dioxide, amino acids, sugars, and other natural plant constituents.

Cycloate's LC_{50} (96 hour) is 4.5 mg/L for rainbow trout, and 10 ppm for mosquito fish. Its acute oral LD_{50} is 2,000-3,190, and 3,160-4,100 mg/kg, for male and female rats, respectively. Cycloate entered the risk assessment process at DPR under the Birth Defect Prevention Act of 1984 based on its toxicity in animal studies. Damage to the nervous system was the major concern, however, cycloate also demonstrated chronic toxicity, oncogenicity and reproductive toxicity.

B. USE OF CYCLOATE

As of September 1998, one cycloate-containing product was registered for use in California. Cycloate is a soil-applied, selective herbicide which is incorporated into the soil or applied below the surface of the soil.

In California, growers use cycloate to control annual grasses and broadleaf weeds in sugarbeets, table beets, and spinach. One product—Ro-Neet® 6-E—accounts for all of the reported use in California. Cycloate product label use rates range from 2.0 to 4.0 pounds of active ingredient per acre for spinach and sugarbeets. To prevent loss of the herbicide, cycloate must be incorporated immediately following application. The label offers several methods for application, including broadcast (overall), band (row), and sprinkler irrigation. For soil injection applications in sugarbeets, the label specifies the use of special equipment designed for soil injection. Cycloate is formulated as an emulsifiable liquid. Cycloate products include the Signal Word "Caution" on their labels.

With DPR's implementation of full pesticide use reporting in 1990, all users must report the agricultural use of any pesticide to their county agricultural commissioner, who subsequently forwards this information to DPR. DPR compiles and publishes the use information in the annual Pesticide Use Report (PUR). Because of California's broad definition for agricultural use, DPR includes data from pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and rights-of-way, postharvest applications of pesticides to agricultural commodities, and all pesticides used in poultry and fish production, and some livestock applications in the PUR. DPR does not collect use information for home and garden use, or for most industrial and institutional uses. The information included in this monitoring recommendation reflects widespread cropland applications of cycloate. Use rates were calculated by dividing the total pounds of cycloate used (where cycloate was applied to acreage) by the total number of acres treated.

According to the PUR, between seventy-one and ninety-three percent of California's total cycloate use occurred in ten counties (Table 2). Historically, cropland applications accounted for all of the total amount of cycloate reported used each year. According to the PUR, prior to 1994 San Joaquin County routinely received the greatest applications of cycloate, followed by Imperial and Solano Counties. However, beginning in 1995, cycloate applications decreased significantly

in San Joaquin and Solano Counties, and continued to rise in Imperial County. Preliminary 1996 PUR information shows similar trends. Over 70 percent of the cycloate applied annually in California is used on sugarbeets (Table 3).

Table 2. Annual Agricultural Use of Cycloate (Pounds of Active Ingredient)

County	1990	1991	1992	1993	1994	1995
Imperial	12,401	10,661	8,508	6,178	8,307	10,129
San Joaquin	17,257	11,197	17,610	12,432	14,654	7,884
Monterey	44	268	79	127	580	1,135
Merced	8,811	5,170	4,146	2,446	4,175	3,859
Ventura	2,699	3,703	2,454	2,233	2,512	3,235
Fresno	929	0	0	5	0	3,650
Solano	3,866	4,713	5,949	13,529	9,134	4,444
Colusa	3,420	1,312	1,152	3,587	2,224	969
Santa Barbara	358	1,579	317	159	70	681
Sutter	5,403	2,273	1,894	2,221	2,033	2,402
Total annual use in top ten counties	*55,189*	*40,876*	*42,109*	*42,917*	*43,690*	*38,390*
Percent of total use	*91*	*90*	*71*	*83*	*76*	*77*
Total California Use	*60,330*	*45,638*	*59,428*	*51,715*	*57,837*	*49,897*

Table 3. Annual Commodity Use of Cycloate (Pounds of Active Ingredient)

Site/Crop	1990	1991	1992	1993	1994	1995
Sugarbeet	55,141	39,584	45,129	47,908	45,302	43,741
Spinach	3,118	5,501	13,823	2,971	10,813	5,491
Beets	2,065	538	476	807	1,720	661
Other Crops/Sites	5	15	0	30	2	4
Total	*60,330*	*45,638*	*59,428*	*51,715*	*57,837*	*49,897*

Figure 1 illustrates the historical patterns of cycloate use in Imperial County. In Imperial County, cycloate applications occurred in September and October, and were associated with applications to sugarbeets. The second highest use occurred in San Joaquin County, where applications began in April, peaked in May, and tailed off in June. San Joaquin County's cycloate use is also associated with applications to sugarbeets.

Figure 1. Monthly Cycloate Use Patterns in Imperial County (1993-1995)

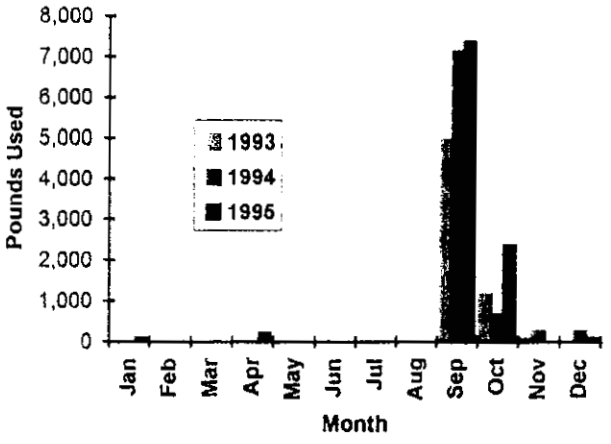
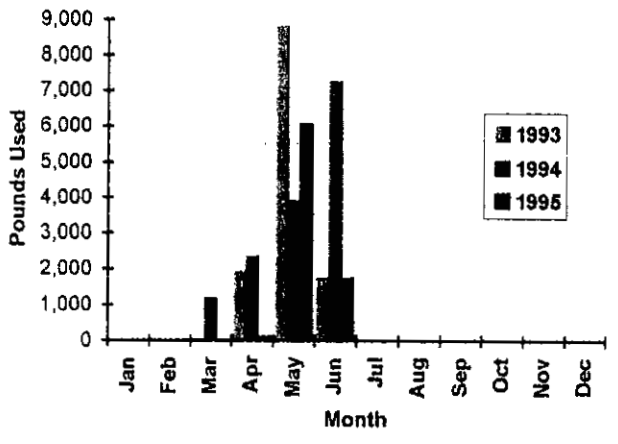


Figure 2. Monthly Cycloate Use Patterns in San Joaquin County (1993-1995)



According to the PUR, most cycloate application rates were typically low, ranging from 1.5 to 3.0 pounds per acre. However, each year several applications occurred at rates ranging from 4.0 to 6.0 pounds per acre. These applications occurred sporadically throughout the application season and were associated with sugarbeets. The cycloate label allows for multiple applications during the season for table beets and spinach crops; however, it specifies making a single seasonal application to sugarbeets. Furthermore, the label recommends using the higher application rates on crops grown in fine-textured soils.

C. RECOMMENDATIONS

1. Ambient Air Monitoring

The recent historical trends in cycloate use suggest that monitoring should occur over a 30- to 45-day sampling period in Imperial County during September and early October associated with applications to sugarbeets (Figure 3). Figure 4 shows the areas of cycloate use in Imperial County by section for 1994 and 1995. Three to five sampling sites should be selected in relatively high-population areas or in areas frequented by people, and should be located near sugarbeet growing areas. Ambient samples should not be collected from samplers immediately adjacent to fields where cycloate is being applied. At each site, twenty to thirty discrete 24-hour samples should be taken during the sampling period. Background samples should be collected in an area distant to cycloate applications. DPR recommends a target 24-hour detection limit of 0.0259 $\mu g/m^3$.

DPR recommends close coordination with the county agricultural commissioner to select the best sampling sites and periods. Replicate (collocated) samples are needed for five dates at each sampling location. In addition to the primary sampler, one collocated sampler should be run on those days. The date chosen for replicate samples should be distributed over the entire sampling

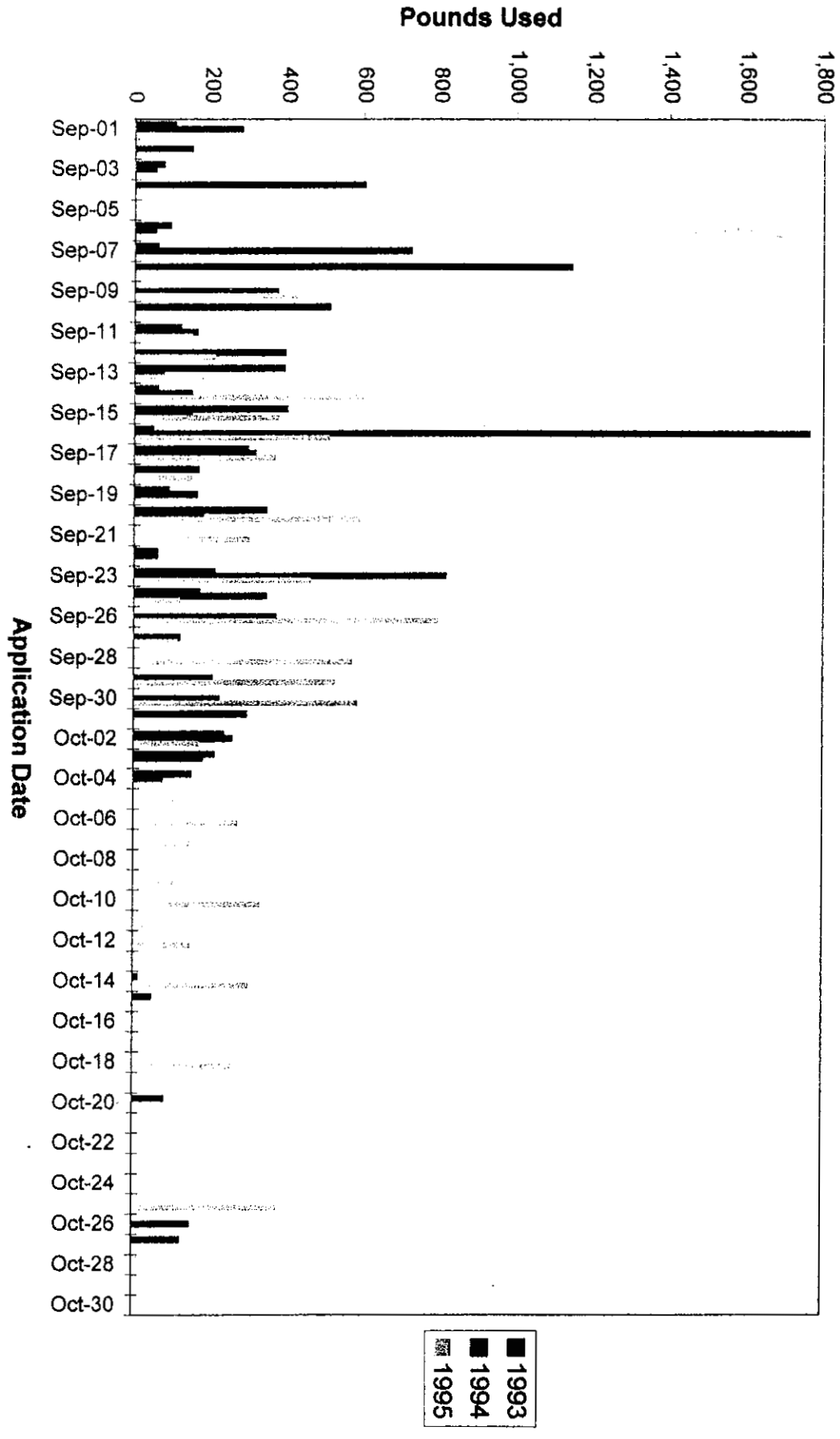
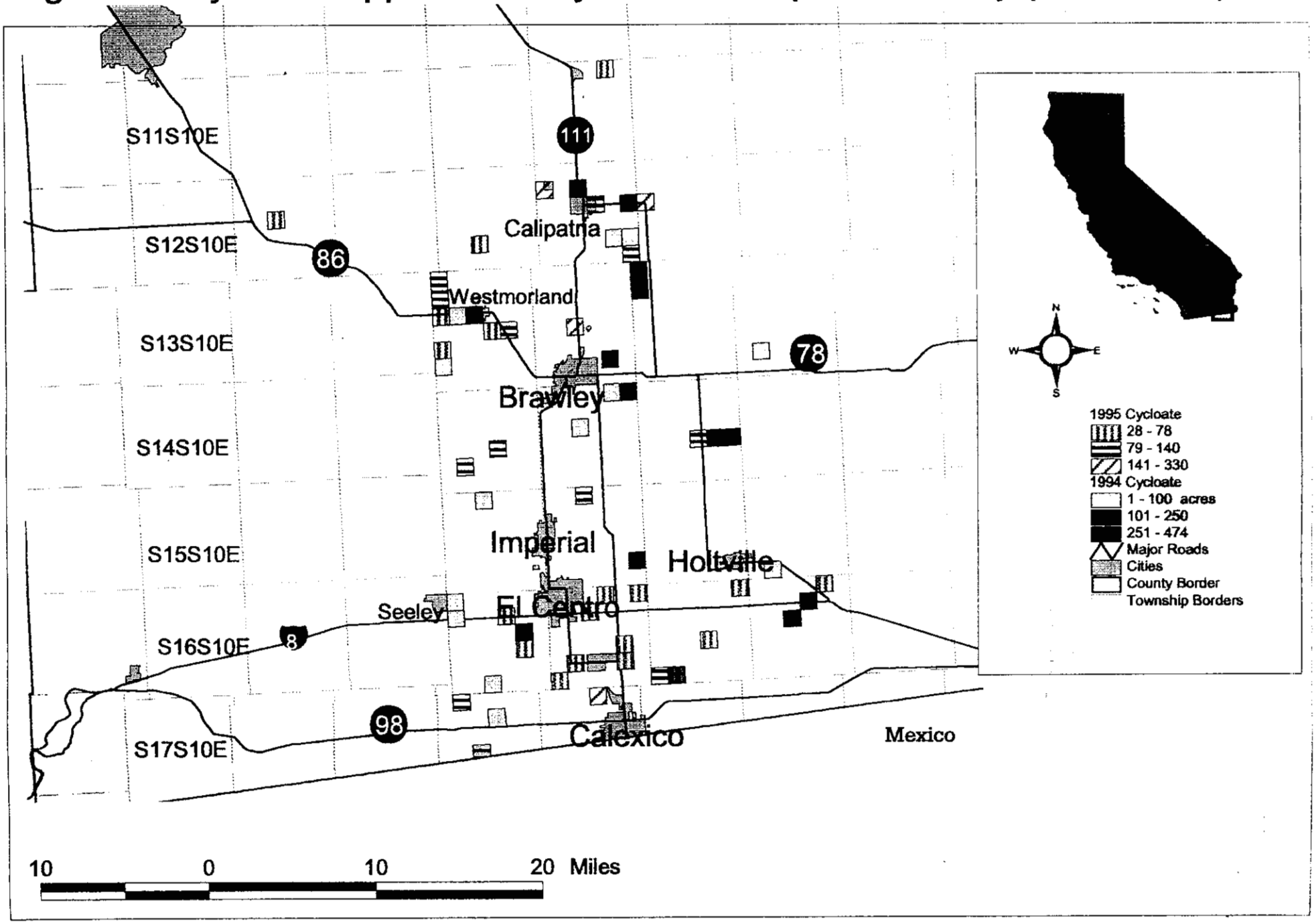


Figure 3. Cycloate Use in Imperial County (1993-1995)

Figure 4. Cycloate Applications by Acres in Imperial County (1994-1995).



period. They may, but need not be, the same dates at every site. Field spike samples should be collected at the same environmental conditions (e.g., temperature, humidity, exposure to sunlight) and experimental conditions (e.g., air flow rates) as those occurring at the time of ambient sampling.

Additionally, we request that you provide in the ambient monitoring report: 1) the proximity of the sampler to treated or potentially treated fields, including the distance and direction, and 2) the distance the sampler is located above the ground.

2. *Application-Site Air Monitoring*

The historical trends in cycloate use and product label information suggest that application-site air monitoring should be conducted during September or October in Imperial County in association with an application to sugarbeets (Figure 3). Ideally, monitoring should occur at a site using the highest rates of use—i.e., a rate of 4.0 pounds per acre or higher. According to label information, these applications are expected to occur associated with applications to sugarbeets grown in fine textured soils. Because some cycloate applications may be associated with a special local need (SLN) registration, monitoring staff should ensure the SLN is still in effect prior to selecting an appropriate monitoring site.

DPR recommends close coordination with the county agricultural commissioner to select the best sampling sites and date. Ideally, the monitoring study should include samples taken before, during, and for 72 hours following application, according to the following schedule:

Sample period begins:	**Sample duration time**
Background (pre-application)	Minimum of 12-hour
During application	length of application time
End of application	1 hour
1 hour post-application	2 hours
3 hours post-application[1]	3 hours (or up to 1 hour before sunset)
6 hours post-application[1]	6 hours (or up to 1 hour before sunset)
1 hour before sunset	overnight[2] (until 1 hour after sunrise)
1 hour after sunrise	daytime (until 1 hour before sunset)
1 hour before sunset	overnight (until 1 hour after sunrise)
1 hour after sunrise	24-hour (until 1 hour after sunrise)

1 These samples and sample duration times may be adjusted depending on length of application time. The important issue is to take at least one 3-6 hour sample between the end of the 2-hour sample and dusk (one hour before sunset).

2 All overnight samples must include the period from one hour before sunset to one hour after sunrise.

Occasionally, a pesticide application may occur all day long over the course of two or more days. In these instances, please collect a sample during the daily application, and an overnight sample between the end of the daily application and the start of application the next morning. Following

the end of the application, begin collecting samples according to the above schedule, beginning with the 1-hour sample. Again, some sample time durations may be adjusted according to the time remaining between end of application and dusk. Regardless of application duration, the study should include at least one 1-hour sample taken immediately following the end of application, at least one 2-4 hour sample (taken following the 1-hour sample), and all overnight samples must include the time period from one hour before sunset to one hour following sunrise.

The selected field should be 10 acres in area, or larger. A minimum of four samplers should be positioned, one on each side of the field. A fifth sampler should be collocated at one position. Since cycloate is extensively used in the area, background samples should collect enough volume (either a minimum12 hours at the same flow rate as the samplers, or a shorter period with a higher volume pump) to achieve the recommended target 24-hour detection limit of 0.0259 $\mu g/m^3$. Ideally, samplers should be placed a minimum of 20 meters from the field. Field spike samples should be collected at the same environmental conditions (temperature humidity, exposure to sunlight) and experimental conditions (similar air flow rates) as those occurring at the time of sampling.

Additionally, we request that you provide in the monitoring report: 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles; 3) meteorological data collected at a minimum of 15-minute intervals including wind speed and direction, humidity, and air temperature, and comments regarding degree of cloud cover; and 4) the elevation of each sampling station with respect to the field, and the orientation of the field with respect to North (identified as either true or magnetic North).

D. SAFETY RECOMMENDATIONS

Monitoring personnel should use proper protective equipment to prevent exposure to the vapors or spray mist. According to the product labels, proper protective equipment for applicators includes long-sleeved shirt and long pants, chemical resistant gloves (such as barrier laminate, nitrile rubber, neoprene rubber, or viton), shoes plus socks. Additional recommendations include protective eyewear, chemical-resistant headgear for overhead exposure, and a cartridge respirator equipped with a filter cartridge approved for use with pesticides. Monitoring personnel should refer to the label of the actual product used for further precautions.

E. GENERAL REFERENCES

DPR. 1992-1995. Annual Pesticide Use Reports. California Department of Pesticide Regulation, Sacramento, California.

DPR. 1998. Pesticide Label Database. California Department of Pesticide Regulation, Sacramento, California.

Humburg, N. E., S.R. Colby, E.R. Hill, L.M. Kitchen, R.G. Lym, W.J. McAvoy, and R. Prasad. 1989. Cycloate *In* The Herbicide Handbook. Sixth Edition. Weed Science Society of America, Champaign, Illinois.

Kelley, K. and N.R. Reed. 1996. Pesticides for evaluation as candidate toxic air contaminants. Report No. EH 96-01. Department of Pesticide Regulation. Sacramento, California.

Kollman, W. and R. Segawa. 1995. Interim report of the pesticide chemistry database. Report No. EH 95-04. Department of Pesticide Regulation. Sacramento, California.

Montgomery, J.H. 1993. Agrochemicals Desk Reference: Environmental Data. Lewis Publishers, Ann Arbor, Michigan.

Tomlin, C. (ed) 1994. Cycloate *In* The Pesticide Manual: Incorporating the Agrochemicals Handbook. Crop Protection Publications, British Crop Protection Council and the Royal Society of Chemistry. United Kingdom.

Winston H. Hickox
Secretary for Environmental Protection

Department of Pesticide Regulation

Paul E. Helliker, Director
830 K Street • Sacramento, California 95814-3510 • www.cdpr.ca.gov

Gray Davis
Governor

MEMORANDUM

TO: Kevin Mongar, Project Engineer
Engineering and Laboratory Branch
Air Resources Board
600 North Market Boulevard (Mail Code B-4)
Sacramento, California 95812

FROM: Randy Segawa, Senior Environmental Research Scientist Segawa
Environmental Monitoring and
Pest Management Branch
(916) 324-4137

DATE: August 19, 1999

SUBJECT: UPDATED PESTICIDE USE REPORT INFORMATION FOR 1999 CYCLOATE AIR MONITORING STUDIES

Our September 1998 *Cycloate Monitoring Recommendation* included Pesticide Use Report (PUR) data from 1990 through 1995. My staff have reviewed the 1996 through 1998 PUR to update the information on cycloate applications in California (see attached tables). According to the PUR, cycloate use in Imperial County has continued to rise. In 1998, Imperial County used more than 1.5 times as much cycloate as Fresno County, which reported the second highest use (Table 1). In Imperial County, cycloate applications occurred in September and early October and were associated with applications to sugarbeets. Cycloate use has also increased dramatically in Fresno, Merced, and Solano Counties from 1996-1998. These applications are associated with either May or June applications to sugarbeets.

Given the consistent patterns of use in Imperial County, we confirm our earlier recommendations to conduct the ambient and application air monitoring studies in there during September and early October near sugarbeet growing areas. We have prepared updated maps to assist you in the placement of air monitoring stations during this year's cycloate air monitoring study. Attached are maps showing the locations and the amounts of cycloate that were used in Imperial County during 1996, 1997, and 1998. We recommend close coordination with the Imperial County Agricultural Commissioner to select the best times and sites for the studies.

If you have any questions regarding the attached information, please contact Pam Wales, of my staff, at (916) 322-3877.

Attachments

cc: Pam Wales, DPR (TAC Files) (w/attachments)
Danny Merkeley, DPR
Stephen L. Birdsall, Imperial County Agricultural Commissioner

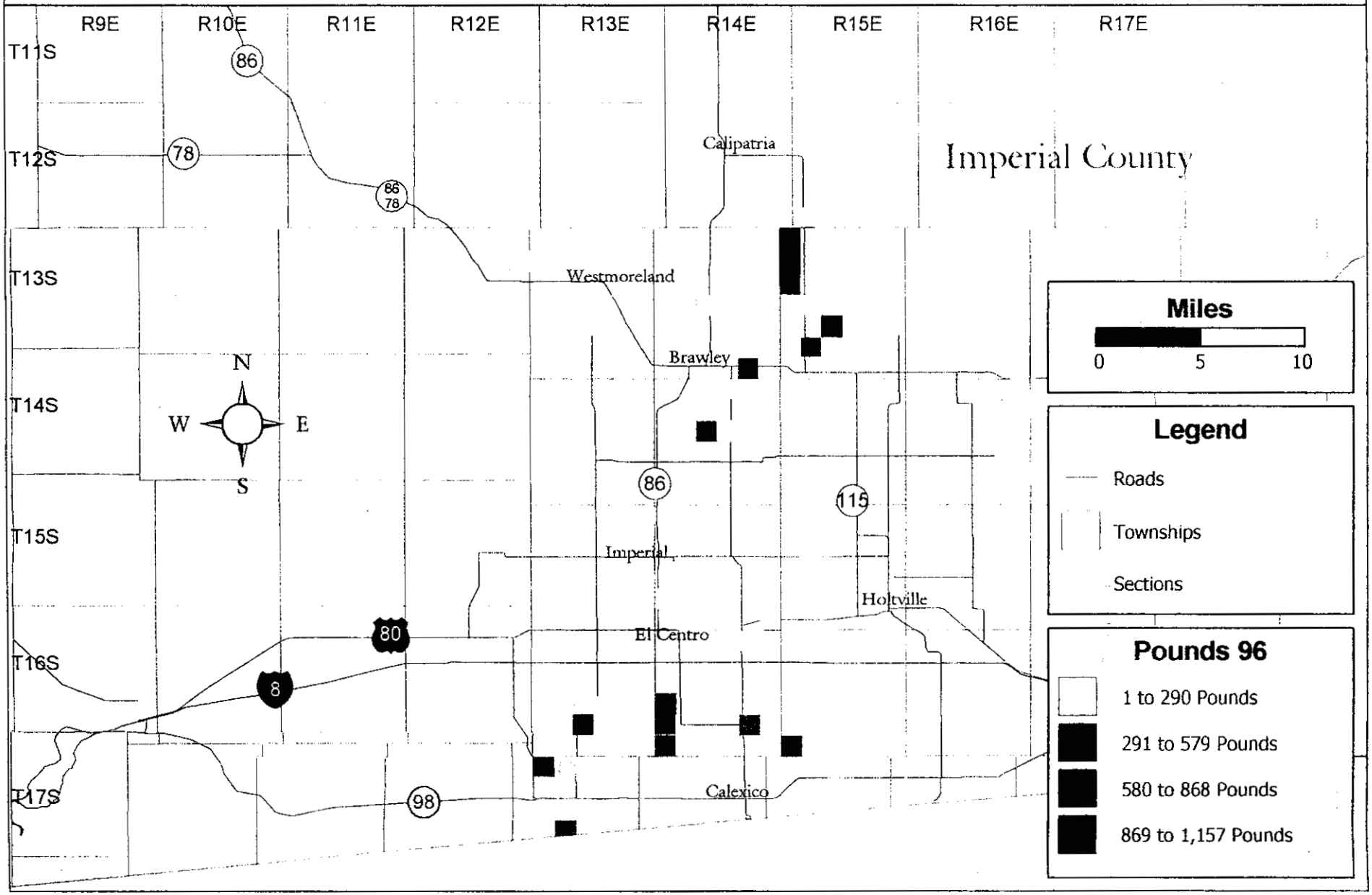
Table 1. Annual Agricultural Use of Cycloate by County (Pounds of Active Ingredient)

County	1996	1997	1998
Imperial	14,834	16,545	15,214
Fresno	2,707	4,091	9,566
Merced	4,904	7,210	7,967
Solano	1,507	5,535	7,411
Monterey	5,165	6,801	5,899
San Benito	17	293	3,884
Yolo	1,016	1,969	3,716
Ventura	3,473	3,008	2,542
Sutter	1,210	860	2,150
Sacramento	771	1,438	1,795
Santa Barbara	1,218	1,558	1,601
San Joaquin	5,589	3,487	1,080
Colusa	1,301	1,421	948
Riverside	737	722	876
Stanislaus	34	20	439
Madera		206	298
San Luis Obispo	221	201	251
Santa Clara	94	147	106
Santa Cruz	85	42	81
Los Angeles		1	65
Kern			18
Orange	3	2	4
Amador			
Contra Costa			
Lassen	36		
San Bernardino		0	
San Francisco			
Shasta	174		
Tehama			
Tulare		6	
Total Pounds Used	***45,097***	***55,564***	***65,911***

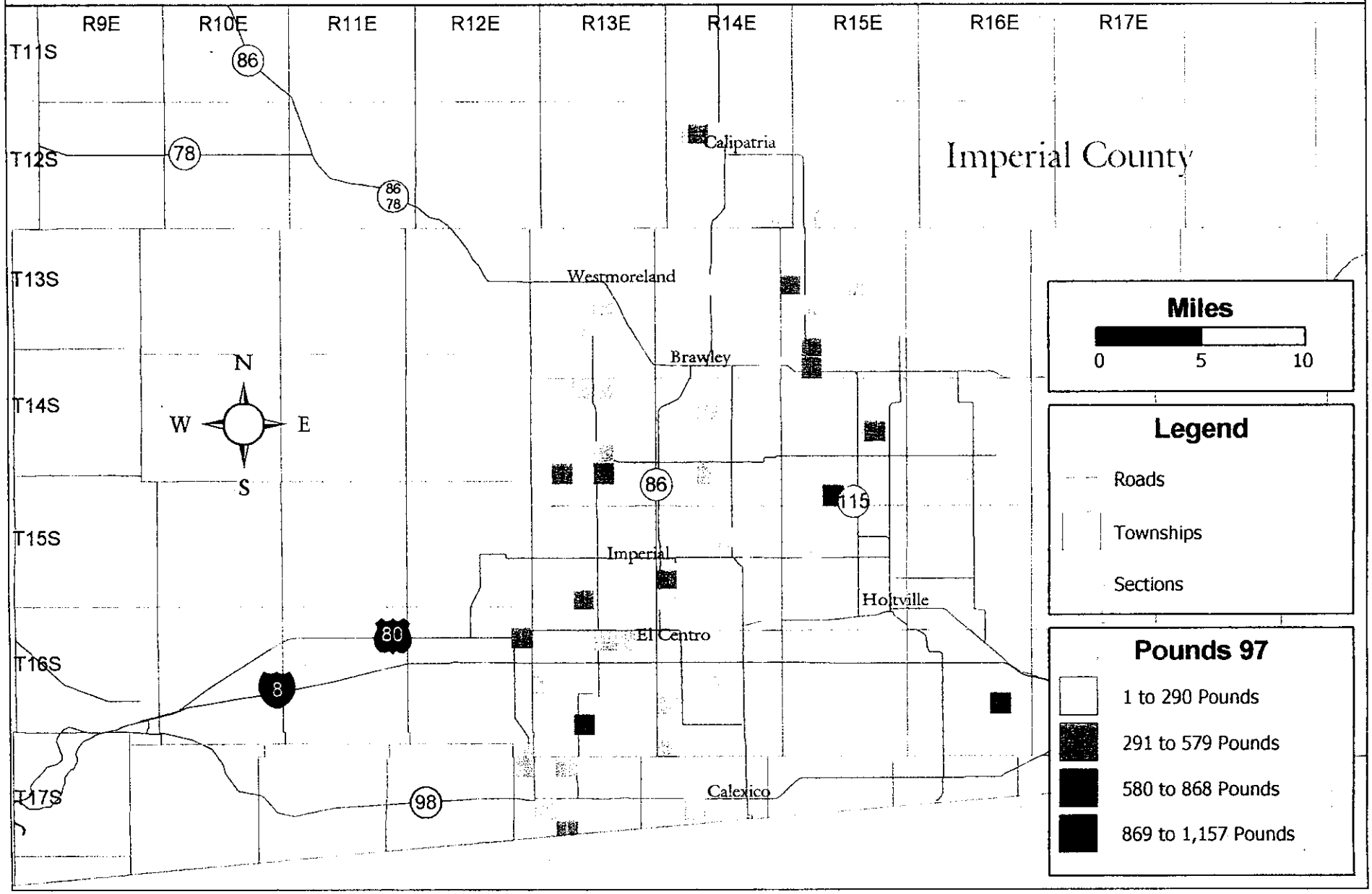
Table 2. Annual Agricultural Use of Cycloate by Commodity (Pounds of Active Ingredient)

CROP	1996	1997	1998
Sugarbeet	33,466	40,269	46,824
Spinach	11,280	14,195	17,343
Beets	350	1,091	964
Other Crops/Uses	1	8	780
Total Pounds Used	***45,097***	***55,564***	***65,911***

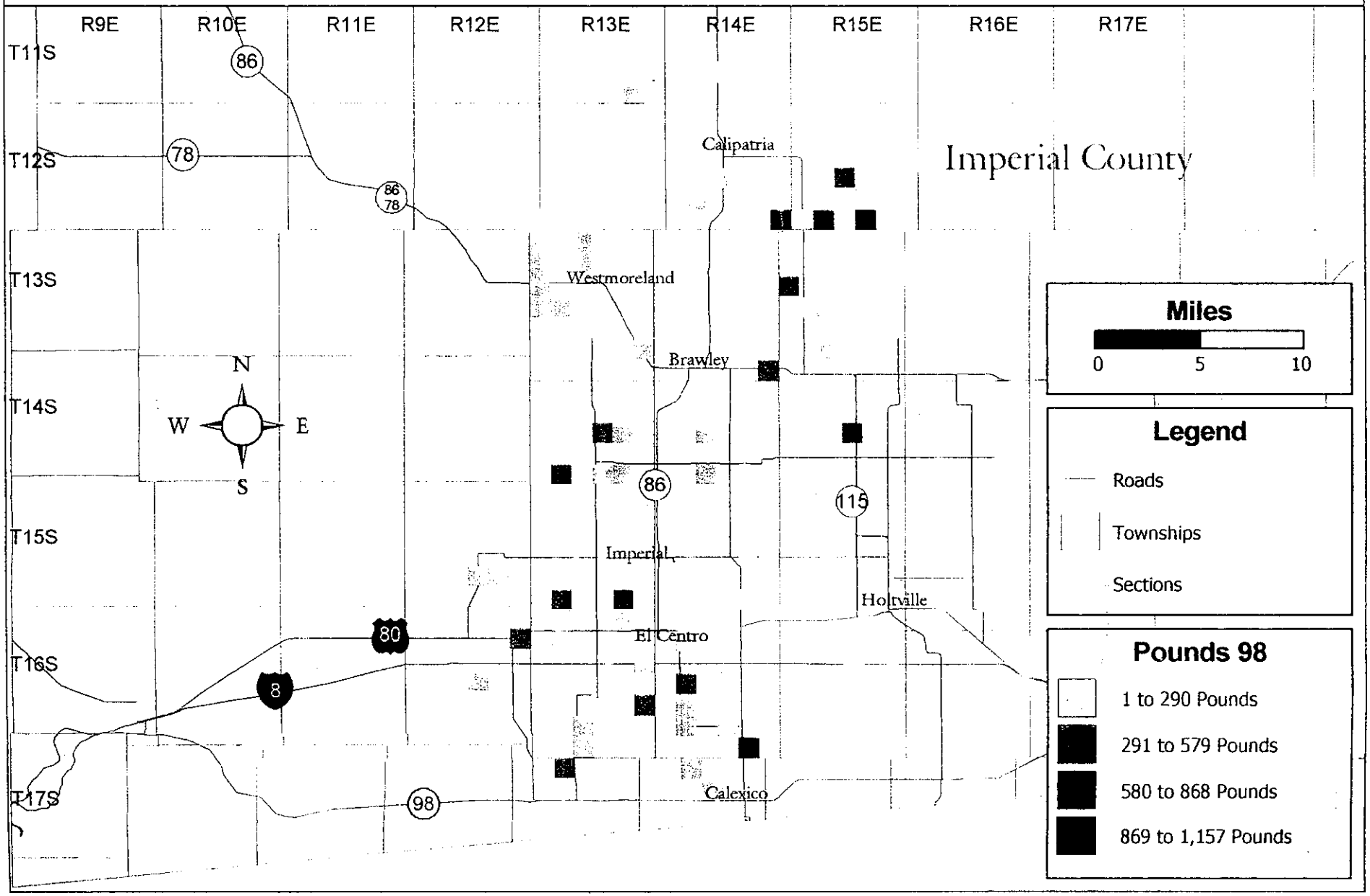
Cycloate Use in Imperial County (Pounds Used)
(August 20-October 10, 1996)



Cycloate Use in Imperial County (Pounds Used)
(August 20-October 10, 1997)



Cycloate Use in Imperial County (Pounds Used)
(August 20-October 10, 1998)



APPENDIX V

APPLICATION AND AMBIENT FIELD LOG SHEETS

Appl start 10/6 7:35

SAMPLE FIELD LOG SHEET

Project: Pesticide Air Monitoring

Project #: C99-084a

Tillage 7:55 start

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Start Leak Check	End Leak Check	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Techn. Initial
1	N2B	10/5 10/6	1530 0620	3.0	2.98	✓	✓	Rotometer # 52	K	OK/.
2	N2FS1	10/5 10/6	1530 0620	3.0	3.0	✓	✓	51		
3	N3B	10/5 10/6	1540 0630	3.0	3.05	✓	✓	59		
4	N3FS2	10/5 10/6	1540 0630	3.0	3.0	✓	✓	510		
5	S2B	10/5 10/6	1600 0645	3.0	3.09	✓	✓	58		
6	S2FS3	10/5 10/6	1600 0645	3.0	3.09	✓	✓	57		
7	S3B	10/5 10/6	1605 0650	3.0	3.14	✓	✓	53		
8	S3FS4	10/5 10/6	1605 0650	3.0	3.09	✓	✓	54		
9	N11	10/6 10/6	0620 1640	3.0	3.0	✓	✓	5-12*	k	OK/.
10	N21	10/6 10/6	0630 1645	3.0	3.2	✓	✓	5-2*		
11	N31	10/6 10/6	0635 1650	3.0	3.05	✓	✓	5-9*		
12	N41	10/6 10/6	0640 1655	3.0	3.0	✓	✓	5-13*		
13	S11	10/6 10/6	0645 1700	3.0	3.0	✓	✓	5-5*		
14	S21	10/6 10/6	0648 1705	3.0	3.0	✓	✓	5-7*		
15	S31	10/6 10/6	0650 1707	3.0	2.6	✓	✓	5-3*		
16	S31D	10/6 10/6	0650 1707	3.0	2.2	✓	✓	5-4*		
17	S41	10/6 10/6	0655 1710	3.0	2.98	✓	✓	5-6 *End Appl. @1630		
18	N12	10/6 10/7	1640 0650	3.0	3.18	✓	✓	5-12	k	OK/
19	N22	10/6 10/7	1645 0655	3.0	3.06	✓	✓	5-2		
20	N32	10/6 10/7	1650 0700	3.0	3.13	✓	✓	5-9		
21	N42	10/6 10/7	1655 0705	3.0	3.0	✓	✓	5-13		
22	S12	10/6 10/7	1700 0707	3.0	3.0	✓	✓	5-5		
23	S22	10/6 10/7	1705 0710	3.0	3.04	✓	✓	5-7		
24	S32	10/6 10/7	1707 0712	3.0	3.08	✓	✓	5-3		

* Tillage failure, stop application @ 0755 and restart at 1145. Also stopped samplers and restart @ 1145

SAMPLE FIELD LOG SHEET

Project: Pesticide Air Monitoring

Project #: C99-084a

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Start Leak Check	End Leak Check	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Techn. Initial
25	S32D	10/6 10/7	1757 0712	3.0	2.91	✓	✓	5-1	k	ORA
26	S42	10/6 10/7	1710 0715	3.0	3.00	✓	✓	5-6	↓	↓
27	N13	10/7 10/7	0650 1657	3.0	3.01	✓	✓	START APPL. @ 0710	k	ORA
28	N23	10/7 10/7	0655 1700	3.0	3.00	✓	✓			
29	N33	10/7 10/7	0700 1703	3.0	3.13	✓	✓			
30	N43	10/7 10/7	0705 1705	3.0	2.78	✓	✓			
31	S13	10/7 10/7	0707 1710	3.0	2.90	✓	✓			
32	S23	10/7 10/7	0710 1712	3.0	2.88	✓	✓			
33	S33	10/7 10/7	0712 1715	3.0	2.98	✓	✓	5-3		
34	S33D	10/7 10/7	0712 1716	3.0	2.98	✓	✓	5-4		
35	S43	10/7 10/7	0715 1720	3.0	2.97	✓	✓	END APPL. @ 1630	↓	↓
36	N14	10/7 10/8	1657 0715	3.0	2.90	✓	✓		k	ORA
37	N24	10/7 10/8	1700 0720	3.0	3.0	✓	✓			
38	N34	10/7 10/8	1703 0725	3.0	3.0	✓	✓			
39	N44	10/7 10/8	1705 0730	3.0	3.0	✓	✓			
40	S14	10/7 10/8	1710 0735	3.0	3.06	✓	✓			
41	S24	10/7 10/8	1712 0739	3.0	3.0	✓	✓			
42	S34	10/7 10/8	1715 0742	3.0	3.08	✓	✓	5-3		
43	S34D	10/7 10/8	1716 0743	3.0	3.05	✓	✓	5-4		
44	S44	10/7 10/8	1720 0750	3.0	3.0	✓	✓		↓	↓
45	N15	10/8 10/8	0715 1125	3.0	3.12	✓	✓	START APPL. @ 0740	k	ORA
46	N25	10/8 10/8	0720 1128	3.0	3.0	✓	✓			
47	N35	10/8 10/8	0725 1130	3.0	2.96	✓	✓			
48	N45	10/8 10/8	0730 1133	3.0	3.0	✓	✓		↓	↓

SAMPLE FIELD LOG SHEET

Project: Pesticide Air Monitoring

Project #: C99-084a

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Start Leak Check	End Leak Check	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Techn. Initial
49	S15	10/8 10/8	0735 1145	3.0	3.14	✓	✓		k	ORF
50	S25	10/8 10/8	0739 1142	3.0	3.0	✓	✓			
51	S35	10/8 10/8	0742 1145	3.0	3.0	✓	✓	5-3		
52	S35D	10/8 10/8	0743 1147	3.0	3.0	✓	✓	5-4		
53	S45	10/8 10/8	0750 1150	3.0	3.0	✓	✓	END APPL. @ 1120		
54	N16	10/8 10/8	1125 1739	3.0	3.0	✓	✓		k	ORF
55	N26	10/8 10/8	1128 1745	3.0	3.0	✓	✓			
56	N36	10/8 10/8	1130 1749	3.0	2.90	✓	✓			
57	N46	10/8 10/8	1133 1752	3.0	3.0	✓	✓			
58	S16	10/8 10/8	1140 1800	3.0	*	✓		*PUMP BURNED OUT UNKNOWN STOP TIME		
59	S26	10/8 10/8	1142 1805	3.0	3.0	✓	✓			
60	S36	10/8 10/8	1145 1808	3.0	3.0	✓	✓	5-3		
61	S36D	10/8 10/8	1147 1810	3.0	3.0	✓	✓	5-4		
62	S46	10/8 10/8	1150 1815	3.0	3.0	✓	✓			
63	TB	10/7	1725	-	-	-	-	TRIP BLANK	-	ORF.
64	TS1	10/7	1725	-	-	-	-	TRIP SPIKE	-	
65	TS2	10/7	1725	-	-	-	-	TRIP SPIKE	-	
66	TS3	10/7	1725	-	-	-	-	TRIP SPIKE	-	
67	TS4	10/7	1725	-	-	-	-	TRIP SPIKE	-	
68	N17	10/8 10/9	1739 0735	3.0	3.05	✓	✓		k	ORF.
69	N27	10/8 10/9	1745 0738	3.0	3.0	✓	✓			
70	N37	10/8 10/9	1749 0741	3.0	3.0	✓	✓			
71	N47	10/8 10/9	1752 0744	3.0	3.0	✓	✓			
72	S17	10/8 10/9	1800 0748	3.0	3.0	✓	✓			

SAMPLE FIELD LOG SHEET

Project: Pesticide Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Start Leak Check	End Leak Check	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Techn. Initial
73	S27	10/8 10/9	1805 0751	3.0	3.0	✓	✓		k	OK
74	S37	10/8 10/9	1808 0754	3.0	3.08	✓	✓	S-3		
75	S37D	10/8 10/9	1810 0755	3.0	2.89	✓	✓	S-4		
76	S47	10/8 10/9	1815 0800	3.0	3.0	✓	✓			
77	N18	10/9 10/10	0735 0726	3.0	3.0	✓	✓		k	OK
78	N28	10/9 10/10	0738 0731	3.0	3.0	✓	✓			
79	N38	10/9 10/10	0741 0736	3.0	3.0	✓	✓			
80	N48	10/9 10/10	0744 0739	3.0	3.0	✓	✓			
81	S18	10/9 10/10	0748 0742	3.0	3.0	✓	✓			
82	S28	10/9 10/10	0751 0745	3.0	3.0	✓	✓			
83	S38	10/9 10/10	0754 0750	3.0	3.25	✓	✓	S-3		
84	S38D	10/9 10/10	0755 0750	3.0	3.0	✓	✓	S-4		
85	S48	10/9 10/10	0800 0755	3.0	3.0	✓	✓			

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Correct I.D.'s	Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
MES1	1	MES 7A	09-02-99	0945	3.00 LPM	2.94 LPM	ROTO 7A	K	
			09-03-99	1025					
MES1D	2	MES 7B	09-02-99	0945	3.00 LPM	2.95 LPM	7B	K	
			09-03-99	1025					
WES1	3	WES 5A	09-02-99	1015	3.00 LPM	2.96 LPM	5A	K	
			09-03-99	1055					
WES1D	4	WES 5B	09-02-99	1015	3.00 LPM	2.95 LPM	5B	K	
			09-03-99	1055					
ELC1	5	ELC 1A	09-02-99	1050	3.00 LPM	3.00 LPM	1A	K	
			09-03-99	1130					
ELC1D	6	ELC 1B	09-02-99	1050	3.00 LPM	2.94 LPM	1B	K	
			09-03-99	1130					
HFD1	7	HFD 4A	09-02-99	1110	3.00 LPM	3.00 LPM	4A	K	
			09-03-99	1155					
HFD1D	8	HFD 4B	09-02-99	1110	3.00 LPM	3.00 LPM	4B	K	
			09-03-99	1155					
CLX1	9	CLX 2A	09-02-99	1140	3.00 LPM	2.94 LPM	2A	K	
			09-03-99	1230					
CLX1Da	10	CLX 2B	09-02-99	1140	3.00 LPM	2.97 LPM	2B	K	
			09-03-99	1230					
CLX1Db	11	CLX 3A	09-02-99	1140	3.00 LPM	2.89 LPM	3A	K	
			09-03-99	1230					
CLX1Dc	12	CLX 3B	09-02-99	1140	3.00 LPM	3.00 LPM	3B	K	
			09-03-99	1230					
MES2	13	MES 7A	09-07-99	0830	3.00 LPM	3.04 LPM		K	
			09-08-99	0830					
WES2	14	WES 5A	09-07-99	0900	3.00 LPM	3.00 LPM		K	
			09-08-99	0900					
ELC2	15	ELC 1A	09-07-99	0940	3.00 LPM	2.96 LPM		K	
			09-08-99	0935					
HFD2	16	HFD 4A	09-07-99	1005	3.00 LPM	2.99 LPM		K	
			09-08-99	1000					
CLX2	17	CLX 2A	09-07-99	1035	3.00 LPM	2.86 LPM		K	
			09-08-99	1035					
CLX2D	18	CLX 3A	09-07-99	1035	3.00 LPM	3.00 LPM		K	
			09-08-99	1035					
MES3	19	MES 7A	09-08-99	0830	3.00 LPM	3.00 LPM		PC	
			09-09-99	0830					
MES3D	20	MES 7B	09-08-99	0830	3.00 LPM	3.05 LPM		PC	
			09-09-99	0830					
WES3	21	WES 5A	09-08-99	0900	3.00 LPM	3.00 LPM		PC	
			09-09-99	0900					
WES3D	22	WES 5B	09-08-99	0900	3.00 LPM	3.00 LPM		PC	
			09-09-99	0900					

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

	Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
ELC3	23	ELC 1A	09-08-99	0935	3.00 LPM	3.06 LPM		PC	
			09-09-99	0935					
ELC3D	24	ELC 1B	09-08-99	0935	3.00 LPM	3.06 LPM		PC	
			09-09-99	0935					
HFD3	25	HFD 4A	09-08-99	1000	3.00 LPM	2.94 LPM		PC	
			09-09-99	1005					
HFD3D	26	HFD 4B	09-08-99	1000	3.00 LPM	2.88 LPM		PC	
			09-09-99	1005					
CLX3	27	CLX 2A	09-08-99	1035	3.00 LPM	3.00 LPM		PC	
			09-09-99	1040					
CLX3Da	28	CLX 2B	09-08-99	1035	3.00 LPM	3.00 LPM		PC	
			09-09-99	1040					
CLX3Db	29	CLX 3A	09-08-99	1035	3.00 LPM	2.96 LPM		PC	
			09-09-99	1040					
CLX3Dc	30	CLX 3B	09-08-99	1035	3.00 LPM	3.00 LPM		PC	
			09-09-99	1040					
MES4	31	MES 7A	09-09-99	0830	3.00 LPM	3.11 LPM		C	
			09-10-99	0825					
WES4	32	WES 5A	09-09-99	0855	3.00 LPM	3.00 LPM		C	
			09-10-99	0850					
ELC4	33	ELC 1A	09-09-99	0930	3.00 LPM	3.07 LPM		C	
			09-10-99	0925					
HFD4	34	HFD 4A	09-09-99	0950	3.00 LPM	3.05 LPM		C	
			09-10-99	0940					
CLX4	35	CLX 2A	09-09-99	1030	3.00 LPM	3.00 LPM		C	
			09-10-99	1030					
	36	MES 5	09-13-99	0830	3.00 LPM	3.00 LPM	7A	k	
			09-14-99	0830					
	37	WES 5	09-13-99	0850	3.00 LPM	2.96 LPM	5A	k	
			09-14-99	0850					
	38	ELC 5	09-13-99	0920	3.00 LPM	3.00 LPM	1A	k	
			09-14-99	0925					
	39	HFD 5	09-13-99	0945	3.00 LPM	3.03 LPM	4A	k	
			09-14-99	0955					
	40	CLX 5	09-13-99	1005	3.00 LPM	3.00 LPM	2A	k	
			09-14-99	1015					
	41	MES 6	09-14-99	0830	3.00 LPM	2.95 LPM	7A	k	
			09-15-99	0825					
	42	WES 6	09-14-99	0850	3.00 LPM	2.96 LPM	5A	k	
			09-15-99	0850					
	43	ELC 6	09-14-99	0925	3.00 LPM	3.00 LPM	1A	k	
			09-15-99	0925					
	44	HFD 6	09-14-99	0955	3.00 LPM	3.00 LPM	4A	k	
			09-15-99	0945					

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
45	CLX 6	09-14-99	1015	3.00 LPM	2.91 LPM	2A	K	
		09-15-99	1005					
46	MES 7	09-15-99	0825	3.00 LPM	3.00 LPM	7A	K	
		09-16-99	0845					
47	MES 7D	09-15-99	0825	3.00 LPM	3.05 LPM	7B	K	
		09-16-99	0845					
48	WES 7	09-15-99	0850	3.00 LPM	3.00 LPM	5A	K	
		09-16-99	0905					
49	WES 7D	09-15-99	0850	3.00 LPM	3.00 LPM	5B	K	
		09-16-99	0905					
50	ELC 7	09-15-99	0925	3.00 LPM	3.00 LPM	1A	K	
		09-16-99	0935					
51	ELC 7D	09-15-99	0925	3.00 LPM	3.06 LPM	1B	K	
		09-16-99	0935					
52	HFO 7	09-15-99	0945	3.00 LPM	3.00 LPM	4A	K	
		09-16-99	1000					
53	HFO 7D	09-15-99	0945	3.00 LPM	3.00 LPM	4B	K	
		09-16-99	1000					
54	CLX 7	09-15-99	1005	3.00 LPM	2.93 LPM	2A	K	
		09-16-99	1020					
55	CLX 7D	09-15-99	1005	3.00 LPM	2.95 LPM	2B	K	
		09-16-99	1020					
56	Trip Blank	~~OPENED and~~				A/xcsd x m freezer	09-16-99	1020
57	MES 8	09-16-99	0845	3.00 LPM	3.00 LPM	7A	K	
		09-17-99	0835					
58	WES 8	09-16-99	0905	3.00 LPM	2.98 LPM	5A	K	
		09-17-99	0905					
59	ELC 8	09-16-99	0935	3.00 LPM	3.00 LPM	1A	K	
		09-17-99	0935					
60	HFO 8	09-16-99	1000	3.00 LPM	3.00 LPM	4A	K	
		09-17-99	0955					
61	CLX 8	09-16-99	1020	3.00 LPM	3.00 LPM	2A	K	
		09-17-99	1015					
62	MES 9	09-20-99	0825	3.00 LPM	3.00 LPM	7A	K	
		09-21-99	0830					
63	WES 9	09-20-99	0845	3.00 LPM	2.98 LPM	5A	K	
		09-21-99	0855					
64	ELC 9	09-20-99	0915	3.00 LPM	2.98 LPM	1A	K	
		09-21-99	0925					
65	HFO 9	09-20-99	0940	3.00 LPM	2.98 LPM	4A	K	
		09-21-99	0950					
66	CLX 9	09-20-99	1000	3.00 LPM	3.00 LPM	2A	K	
		09-21-99	1010					

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
67	MES 10	09-21-99 / 09-22-99	0830 / 0830	3.00 LPM	3.10 LPM	Sample - 7H	O	
68	WES 10	09-21-99 / 09-22-99	0835 / 0835	3.00 LPM	3.15 LPM	Sample 5A	O	
69	ELC 10	09-21-99 / 09-22-99	0925 / 0930	3.00 LPM	3.07 LPM	Sample 1A	O	
70	HFD 10	09-21-99 / 09-22-99	0950 / 0950	3.00 LPM	3.21 LPM	Sample 4A	O	
71	CLX 10	09-21-99 / 09-22-99	1000 / 1005	3.00 LPM	3.17 LPM	Sample 3A	O	
72	Trip Blank	09-22-99	0930	Sealed	Sealed	Placed in Refrigerator 09-22-99 1030		
73	MES 11	09-22-99 / 09-23-99	0830 / 0830	3.00 LPM	3.21 LPM	Sample 7A	O	
74	MES 11D	09-22-99 / 09-23-99	0830 / 0830	3.00 LPM	2.86 LPM	Sample 2B	O	
75	WES 11	09-22-99 / 09-23-99	0855 / 0900	3.00 LPM	3.00 LPM	Sample 5A	O	
76	WES 11D	09-22-99 / 09-23-99	0855 / 0900	3.00 LPM	2.97 LPM	Sample 5B	O	
77	ELC 11	09-22-99 / 09-23-99	0930 / 0935	3.00 LPM	3.00 LPM	Sample 1A	O	
78	ELC 11D	09-22-99 / 09-23-99	0930 / 0935	3.00 LPM	3.08 LPM	Sample 1B	O	
79	HFD 11	09-22-99 / 09-23-99	0950 / 1000	3.00 LPM	3.00 LPM	Sample 4A	O	
80	HFD 11D	09-22-99 / 09-23-99	0950 / 1000	3.00 LPM	3.25 LPM	Sample 4B	O	
81	CLX 11	09-22-99 / 09-23-99	1005 / 1015	3.00 LPM	2.84 LPM	Sample 3A	O	
82	CLX 11D	09-22-99 / 09-23-99	1005 / 1015	3.00 LPM	2.90 LPM	Sample 3B	O	
83	MES 12	09-23-99 / 09-24-99	0830 / 0845	3.00 LPM	3.07 LPM	Sample 7A	K	
84	WES 12	09-23-99 / 09-24-99	0900 / 0915	3.00 LPM	2.91 LPM	Sample 5A	K	
85	ELC 12	09-23-99 / 09-24-99	0935 / 1000	3.00 LPM	3.06 LPM	Sample 1A	K	
86	HFD 12	09-23-99 / 09-24-99	1000 / 1025	3.00 LPM	3.00 LPM	Sample 4A	K	
87	CLX 12	09-23-99 / 09-24-99	1015 / 1040	3.00 LPM	2.91 LPM	Sample 3A	K	
88	MES 13	09-27-99 / 09-28-99	0905 / 0930	3.00 LPM	3.14 LPM	Sample 7A	K	

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
89	WES 13	09-27-99 09-28-99	0930 1000	3.00 LPM	3.13 LPM	Sample 5A	k	
90	ELC 13	09-27-99 09-28-99	0955 0850	3.00 LPM	3.13 LPM	Sample 1A	k	
91	HFD 13	09-27-99 09-28-99	1015 1040	3.00 LPM	3.19 LPM	Sample 4A	k	
92	CLX 13	09-27-99 09-28-99	1040 1100	3.00 LPM	3.08 LPM	Sample 3A	k	
93	MES 14	09-28-99 09-29-99	0930 0840	3.00 LPM	3.12 LPM	Sample 7A	k	
94	WES 14	09-28-99 09-29-99	1000 0905	3.00 LPM	3.00 LPM	Sample 5A	k	
95	ELC 14	09-28-99 09-29-99	0850 0945	3.00 LPM	3.00 LPM	Sample 1A	k	
96	HFD 14	09-28-99 09-29-99	1040 1005	3.00 LPM	3.19 LPM	Sample 4A	k	
97	CLX 14	09-28-99 09-29-99	1100 1030	3.00 LPM	2.89 LPM	Sample 3A	k	
98	CAFS 922-1	09-28-99 09-29-99	1100 1030	3.00 LPM	2.97 LPM	Sample 2A	k	
99	CAFS 922-2	09-28-99 09-29-99	1100 1030	3.00 LPM	2.97 LPM	Sample 2B	k	
100	CATS 922-1	~~Trip~~	~~Spike~~	Placed in freezer 09-29-99 / 1045 w/ other samples				
101	CATS 922-2	~~Trip~~	~~Spike~~	Placed in freezer 09-29-99 / 1045 w/ other samples				
102	MES 15	09-29-99 09-30-99	0840 0830	3.00 LPM	2.96 LPM	Sample 7A	k	
103	MES 15D	09-29-99 09-30-99	0840 0830	3.00 LPM	2.99 LPM	Sample 7B	k	
104	WES 15	09-29-99 09-30-99	0905 0855	3.00 LPM	3.00 LPM	Sample 5A	k	
105	WES 15D	09-29-99 09-30-99	0905 0855	3.00 LPM	3.08 LPM	Sample 5B	k	
106	ELC 15	09-29-99 09-30-99	0945 0930	3.00 LPM	3.09 LPM	Sample 1A	k	
107	ELC 15D	09-29-99 09-30-99	0945 0930	3.00 LPM	3.10 LPM	Sample 1B	k	
108	HFD 15	09-29-99 09-30-99	1005 0950	3.00 LPM	3.24 LPM	Sample 4A	k	
109	HFD 15D	09-29-99 09-30-99	1005 0950	3.00 LPM	3.33 LPM	Sample 4B	k	
110	CLX 15	09-29-99 09-30-99	1030 1030	3.00 LPM	3.25 LPM	Sample 3A	k	

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
111	CLX 15D	09-29-99 09-30-99	1030 1030	3.00 L/min	3.27 L/min	Sample 3B	k	
112	CAFS 922-3	09-29-99 09-30-99	1030 1030	3.00 L/min	3.28 L/min	Sample 2A	k	
113	CAFS 922-4	09-29-99 09-30-99	1030 1030	3.00 L/min	3.30 L/min	Sample 2B	k	
114	CATS 922-3	Trip Spike		placed in freezer w/ other samples on 9-30-99 10:				
115	CATS 922-4	~~Trip Spike~~		placed in freezer w/ other samples on 09-30-99 10:				
116	MES 16	09-30-99 10-01-99	0830 0830	3.00 L/min	3.33 L/min	Sample 7A	k	
117	WES 16	09-30-99 10-01-99	0855 0855	3.00 L/min	2.96 L/min	Sample 5A	k	
118	ELC 16	09-30-99 10-01-99	0930 0930	3.00 L/min	3.00 L/min	Sample 1A	k	
119	HFO 16	09-30-99 10-01-99	0950 0945	3.00 L/min	2.97 L/min	Sample 4A	k	
120	CLX 16	09-30-99 10-01-99	1030 1030	3.00 L/min	2.86 L/min	Sample 3A	k	
121	MES 17	10-04-99 10-05-99	0845 0835	3.00 L/min	3.00 L/min	Sample 7A	k	
122	WES 17	10-04-99 10-05-99	0910 0900	3.00 L/min	2.91 L/min	Sample 5A	k	
123	ELC 17	10-04-99 10-05-99	0940 0930	3.00 L/min	3.00 L/min	Sample 1A	k	
124	HFO 17	10-04-99 10-05-99	1005 0950	3.00 L/min	3.00 L/min	Sample 4A	k	
125	CLX 17	10-04-99 10-05-99	1040 1020	3.00 L/min	2.86 L/min	Sample 3A	k	
126	MES 18	10-05-99 10-06-99	0835 0840	3.00 L/min	3.14 L/min	Sample 7A	k	
127	WES 18	10-05-99 10-06-99	0900 0910	3.00 L/min	3.00 L/min	Sample 5A	k	
128	ELC 18	10-05-99 10-06-99	0930 0945	3.00 L/min	3.06 L/min	Sample 1A	k	
129	HFO 18	10-05-99 10-06-99	0950 1000	3.00 L/min	3.15 L/min	Sample 4A	k	
130	CLX 18	10-05-99 10-06-99	1020 1030	3.00 L/min	3.00 L/min	Sample 3A	k	
131	MES 19	10-06-99 10-07-99	0840 0940	3.00 L/min	2.94 L/min	Sample 7A	k	
132	MES 19D	10-06-99 10-07-99	0840 0940	3.00 L/min	2.72 L/min	Sample 7B	k	

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
133	WES 19	10-06-99 / 10-07-99	0910 / 0920	3.00 L/min	2.94 L/min	Sampler 5A	k	
134	WES 19D	10-06-99 / 10-07-99	0910 / 0920	3.00 L/min	2.72 L/min	Sampler 5B	k	
135	ELC 19	10-06-99 / 10-07-99	0945 / 0845	3.00 L/min	3.10 L/min	Sampler 1A	k	
136	ELC 19D	10-06-99 / 10-07-99	0945 / 0845	3.00 L/min	3.08 L/min	Sampler 1B	k	
137	HFO 19	10-06-99 / 10-07-99	1000 / 1040	3.00 L/min	2.97 L/min	Sampler 4A	k	
138	HFO 19D	10-06-99 / 10-07-99	1000 / 1040	3.00 L/min	2.93 L/min	Sampler 4B	k	
139	CLX 19	10-06-99 / 10-07-99	1030 / 1115	3.00 L/min	3.00 L/min	Sampler 3A	k	
140	CLX 19D	10-06-99 / 10-07-99	1030 / 1115	3.00 L/min	3.00 L/min	Sampler 3B	k	
141	Trip blank ~~opened~~					and placed in freezer on 10-07-99/1115		
142	MES 20	10-07-99 / 10-08-99	0940 / 0835	3.00 L/min	3.10 L/min	Sampler 7A	k	
143	WES 20	10-07-99 / 10-08-99	0920 / 0900	3.00 L/min	3.00 L/min	Sampler 5A	k	
144	ELC 20	10-07-99 / 10-08-99	0845 / 0930	3.00 L/min	3.17 L/min	Sampler 1A	k	
145	HFO 20	10-07-99 / 10-08-99	1040 / 1000	3.00 L/min	3.14 L/min	Sampler 4A	k	
146	CLX 20	10-07-99 / 10-08-99	1115 / 1015	3.00 L/min	3.17 L/min	Sampler 3A	k	
147	MES 21	10-12-99 / 10-13-99	0815 / 0810	3.00 L/min	2.93 L/min	Sampler 7A	k	
148	WES 21	10-12-99 / 10-13-99	0855 / 0835	3.00 L/min	2.94 L/min	Sampler 5A	k	
149	ELC 21	10-12-99 / 10-13-99	0930 / 0900	3.00 L/min	2.96 L/min	Sampler 1A	k	
150	HFO 21	10-12-99 / 10-13-99	0950 / 0920	3.00 L/min	3.00 L/min	Sampler 4A	k	
151	CLX 21	10-12-99 / 10-13-99	1020 / 0940	3.00 L/min	3.10 L/min	Sampler 3A	k	
152	MES 22	10-13-99 / 10-14-99	0810 / 0825	3.00 L/min	3.19 L/min	Sampler 7A	k	
153	MES 22D	10-13-99 / 10-14-99	0810 / 0825	3.00 L/min	3.21 L/min	Sampler 7B	k	
154	WES 22	10-13-99 / 10-14-99	0835 / 0900	3.00 L/min	3.33 L/min	Sampler 5A	k	

SAMPLE FIELD LOG BOOK

Project: Cycloate Ambient Air Monitoring

Project #: C99-084

Log #	Sample ID	Date On/Off	Time On/Off	Start Flow	End Flow	Comments	Weather o=overcast pc=partly c=cloudy k=clear	Sampler's Initials
155	WES 22D	10-13-99 10-14-99	0855 0900	3.00 L/min	3.40 L/min	Sample 5B	k	
156	ELC 22	10-13-99 10-14-99	0900 0930	3.00 L/min	3.13 L/min	Sample 1A	k	
157	ELC 22D	10-13-99 10-14-99	0900 0930	3.00 L/min	3.14 L/min	Sample 1B	k	
158	HFD 22	10-13-99 10-14-99	0920 0945	3.00 L/min	3.00 L/min	Sample 4A	k	
159	HFD 22D	10-13-99 10-14-99	0920 0945	3.00 L/min	3.00 L/min	Sample 4B	k	
160	CLX 22	10-13-99 10-14-99	0940 1010	3.00 L/min	2.95 L/min	Sample 3A	k	
161	CLX 22D	10-13-99 10-14-99	0940 1010	3.00 L/min	2.96 L/min	Sample 3B	k	
162	Trip blank	~~opened~~				placed in freezer on 10-14-99/1015		
163	WES 23	10-14-99 10-15-99	0825 0845	3.00 L/min	3.00 L/min	Sample 7A	k	
164	WES 23	10-14-99 10-15-99	0900 0945	3.00 L/min	2.74 L/min	Sample 5A	k	
165	ELC 23	10-14-99 10-15-99	0930 1020	3.00 L/min	2.88 L/min	Sample 1A	k	
166	HFD 23	10-14-99 10-15-99	0945 1045	3.00 L/min	2.86 L/min	Sample 4A	k	
167	CLX 23	10-14-99 10-15-99	1010 1110	3.00 L/min	2.82 L/min	Sample 3A	k	

APPENDIX VI

CYCLOATE APPLICATION METEOROLOGICAL DATA

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/5/99	13:15	3.1	40	101	4.8	29.85	61.6
10/5/99	13:30	3.9	338	101	3.9	29.86	37.6
10/5/99	13:45	2.7	10	102	2.9	29.85	85.3
10/5/99	14:00	3.1	13	103	3.1	29.85	51.4
10/5/99	14:15	2.4	297	104	3.0	29.84	47.6
10/5/99	14:30	2.5	16	104	3.2	29.83	89.7
10/5/99	14:45	3.2	330	103	2.9	29.83	50.6
10/5/99	15:00	5.5	330	102	2.9	29.83	36.2
10/5/99	15:15	4.8	354	102	2.9	29.82	35.8
10/5/99	15:30	5.1	308	102	2.9	29.82	18.6
10/5/99	15:45	5.3	326	102	2.9	29.82	23.3
10/5/99	16:00	4.9	303	101	2.9	29.82	27.7
10/5/99	16:15	2.5	340	102	2.9	29.82	94.9
10/5/99	16:30	3.9	17	102	2.9	29.81	20.8
10/5/99	16:45	2.7	94	102	3.1	29.81	76.5
10/5/99	17:00	4.6	302	101	3.2	29.81	47.9
10/5/99	17:15	6.0	264	100	5.2	29.80	20.0
10/5/99	17:30	13.4	278	97	12.0	29.81	8.6
10/5/99	17:45	14.0	279	95	14.7	29.81	5.9
10/5/99	18:00	13.5	276	94	14.8	29.81	6.2
10/5/99	18:15	13.7	276	92	15.5	29.81	6.1
10/5/99	18:30	13.2	278	90	16.7	29.81	5.7
10/5/99	18:45	12.8	277	88	18.1	29.81	5.8
10/5/99	19:00	12.4	278	87	19.0	29.81	5.5
10/5/99	19:15	10.4	281	85	20.5	29.81	5.6
10/5/99	19:30	12.3	285	85	18.7	29.80	6.0
10/5/99	19:45	15.5	285	86	16.5	29.80	5.4
10/5/99	20:00	13.9	282	85	17.7	29.80	5.6
10/5/99	20:15	15.5	276	85	16.8	29.80	6.6
10/5/99	20:30	13.9	262	84	18.2	29.81	8.3
10/5/99	20:45	15.2	262	83	18.9	29.80	5.9
10/5/99	21:00	17.7	268	84	17.0	29.80	6.1
10/5/99	21:15	19.7	272	85	16.1	29.80	5.7
10/5/99	21:30	15.9	268	84	17.0	29.80	5.3
10/5/99	21:45	13.4	268	82	18.2	29.80	5.4
10/5/99	22:00	11.6	257	80	21.9	29.80	5.5
10/5/99	22:15	13.1	258	80	22.2	29.80	4.8
10/5/99	22:30	13.3	262	80	21.4	29.80	4.4
10/5/99	22:45	12.8	262	80	21.9	29.79	4.2
10/5/99	23:00	12.8	264	79	22.4	29.79	4.6
10/5/99	23:15	13.8	260	79	23.8	29.79	5.0
10/5/99	23:30	13.8	272	79	22.3	29.78	6.8
10/5/99	23:45	15.7	270	80	20.4	29.78	6.6
10/5/99	24:00:00	16.8	265	81	19.4	29.78	5.5
10/6/99	0:15	16.6	266	80	19.9	29.77	5.4

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/6/99	0:30	15.0	269	80	20.4	29.77	6.3
10/6/99	0:45	14.7	267	79	20.4	29.76	6.3
10/6/99	1:00	13.7	258	78	22.1	29.76	5.5
10/6/99	1:15	17.3	261	78	20.9	29.76	5.5
10/6/99	1:30	16.5	267	79	19.3	29.75	5.6
10/6/99	1:45	17.7	266	79	19.5	29.75	5.7
10/6/99	2:00	16.7	269	78	20.0	29.75	5.5
10/6/99	2:15	15.0	268	78	20.5	29.75	6.2
10/6/99	2:30	12.5	241	75	25.1	29.75	9.9
10/6/99	2:45	9.2	267	75	23.4	29.74	8.6
10/6/99	3:00	8.7	257	75	22.9	29.74	7.0
10/6/99	3:15	8.7	270	76	20.8	29.73	6.4
10/6/99	3:30	10.3	284	75	21.2	29.72	5.9
10/6/99	3:45	8.5	295	72	25.0	29.72	6.6
10/6/99	4:00	10.0	297	71	25.8	29.71	6.2
10/6/99	4:15	14.1	287	73	22.6	29.71	7.4
10/6/99	4:30	13.7	300	74	19.8	29.71	5.0
10/6/99	4:45	12.4	308	75	17.7	29.71	5.9
10/6/99	5:00	11.4	312	75	17.6	29.71	7.2
10/6/99	5:15	8.4	319	73	20.0	29.71	16.6
10/6/99	5:30	14.4	293	73	18.7	29.72	4.6
10/6/99	5:45	12.8	295	73	18.6	29.72	6.3
10/6/99	6:00	11.2	319	72	20.8	29.72	7.8
10/6/99	6:15	15.2	316	73	18.2	29.72	8.8
10/6/99	6:30	18.5	286	74	16.3	29.71	7.6
10/6/99	6:45	15.5	301	74	16.9	29.72	11.5
10/6/99	7:00	14.7	296	72	19.8	29.73	8.4
10/6/99	7:15	10.5	284	73	19.6	29.74	7.0
10/6/99	7:30	12.1	300	73	19.1	29.75	9.2
10/6/99	7:45	18.6	276	75	16.8	29.74	7.9
10/6/99	8:00	16.4	270	77	16.6	29.75	11.6
10/6/99	8:15	6.7	329	77	18.4	29.76	34.0
10/6/99	8:30	16.0	262	78	17.4	29.77	7.9
10/6/99	8:45	19.7	269	80	15.8	29.77	8.1
10/6/99	9:00	22.7	276	81	13.5	29.78	7.0
10/6/99	9:15	20.4	275	82	12.4	29.79	7.4
10/6/99	9:30	21.7	280	82	12.0	29.80	6.1
10/6/99	9:45	22.6	279	83	10.6	29.81	6.5
10/6/99	10:00	20.8	282	84	10.9	29.82	8.7
10/6/99	10:15	20.8	283	84	10.9	29.82	7.7
10/6/99	10:30	20.7	278	85	8.9	29.82	6.9
10/6/99	10:45	19.8	278	86	7.9	29.82	8.3
10/6/99	11:00	19.3	271	86	7.4	29.82	7.6
10/6/99	11:15	19.1	280	86	6.9	29.82	6.5
10/6/99	11:30	18.9	281	87	6.2	29.82	9.1

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/6/99	11:45	20.1	268	88	4.9	29.82	8.8
10/6/99	12:00	18.0	275	89	4.8	29.81	10.7
10/6/99	12:15	16.9	262	89	4.8	29.81	12.7
10/6/99	12:30	17.7	258	89	5.6	29.81	12.6
10/6/99	12:45	18.9	250	88	8.5	29.80	8.7
10/6/99	13:00	21.9	254	88	10.1	29.79	10.5
10/6/99	13:15	23.5	251	88	11.8	29.78	10.4
10/6/99	13:30	21.9	255	89	12.1	29.78	9.6
10/6/99	13:45	25.9	257	89	14.0	29.76	9.8
10/6/99	14:00	27.8	254	88	16.1	29.76	8.1
10/6/99	14:15	26.4	259	88	16.2	29.76	8.4
10/6/99	14:30	27.1	247	87	17.4	29.76	9.3
10/6/99	14:45	26.2	251	87	17.7	29.76	6.9
10/6/99	15:00	26.4	255	87	18.3	29.75	6.7
10/6/99	15:15	26.6	254	87	18.7	29.75	7.2
10/6/99	15:30	27.5	251	86	19.5	29.75	7.1
10/6/99	15:45	27.1	251	86	20.3	29.74	6.9
10/6/99	16:00	28.1	256	85	21.1	29.74	7.7
10/6/99	16:15	26.4	255	85	21.4	29.74	6.4
10/6/99	16:30	24.5	257	85	21.7	29.74	7.4
10/6/99	16:45	26.4	257	84	21.8	29.73	6.5
10/6/99	17:00	27.4	258	83	21.9	29.72	6.3
10/6/99	17:15	24.0	261	83	22.3	29.72	6.9
10/6/99	17:30	26.2	260	82	23.4	29.72	6.3
10/6/99	17:45	26.3	259	81	24.5	29.72	5.9
10/6/99	18:00	22.7	262	80	25.3	29.72	5.6
10/6/99	18:15	16.7	254	79	27.2	29.72	6.9
10/6/99	18:30	19.2	260	78	26.6	29.72	6.1
10/6/99	18:45	17.2	259	77	28.8	29.72	5.1
10/6/99	19:00	16.7	252	75	31.3	29.71	6.7
10/6/99	19:15	18.4	252	74	32.9	29.71	6.2
10/6/99	19:30	20.3	260	74	33.0	29.71	5.5
10/6/99	19:45	17.9	264	74	33.6	29.71	5.8
10/6/99	20:00	20.5	267	74	33.1	29.71	6.5
10/6/99	20:15	20.8	272	73	33.7	29.71	6.2
10/6/99	20:30	21.3	270	73	33.1	29.71	5.7
10/6/99	20:45	20.3	271	73	33.3	29.71	5.9
10/6/99	21:00	20.3	271	72	34.1	29.71	6.0
10/6/99	21:15	18.0	272	72	34.8	29.71	6.0
10/6/99	21:30	15.7	266	72	35.3	29.71	6.1
10/6/99	21:45	14.0	270	71	35.5	29.71	6.0
10/6/99	22:00	13.2	276	71	36.6	29.71	6.0
10/6/99	22:15	15.4	278	70	38.5	29.71	5.2
10/6/99	22:30	15.5	278	70	38.4	29.71	5.9
10/6/99	22:45	13.7	279	69	39.9	29.72	5.2

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/6/99	23:00	12.5	275	69	40.3	29.72	5.5
10/6/99	23:15	11.9	279	68	41.2	29.72	5.3
10/6/99	23:30	12.2	272	69	40.3	29.72	6.3
10/6/99	23:45	13.0	266	69	39.7	29.72	5.4
10/6/99	24:00:00	13.8	278	69	39.1	29.72	8.1
10/7/99	0:15	13.1	284	68	41.1	29.72	6.7
10/7/99	0:30	12.7	284	68	41.6	29.73	6.4
10/7/99	0:45	11.1	281	68	42.2	29.73	5.6
10/7/99	1:00	11.3	289	67	43.4	29.74	5.6
10/7/99	1:15	10.6	284	67	43.8	29.74	5.1
10/7/99	1:30	9.2	283	66	44.7	29.74	4.7
10/7/99	1:45	9.5	281	66	45.3	29.74	5.6
10/7/99	2:00	10.4	280	65	46.1	29.75	4.8
10/7/99	2:15	9.7	278	65	46.2	29.75	7.5
10/7/99	2:30	8.7	272	66	43.0	29.75	6.3
10/7/99	2:45	7.3	271	65	44.1	29.75	6.8
10/7/99	3:00	7.7	257	66	42.0	29.75	2.8
10/7/99	3:15	7.2	256	65	42.2	29.75	4.1
10/7/99	3:30	7.2	255	65	44.1	29.75	3.5
10/7/99	3:45	7.9	256	65	43.2	29.75	3.2
10/7/99	4:00	8.4	263	65	41.0	29.75	4.4
10/7/99	4:15	8.7	271	66	40.0	29.75	7.1
10/7/99	4:30	8.4	254	66	40.3	29.75	4.2
10/7/99	4:45	8.0	245	64	44.7	29.75	3.1
10/7/99	5:00	7.3	240	63	45.2	29.76	2.6
10/7/99	5:15	7.6	241	63	45.2	29.77	5.4
10/7/99	5:30	6.9	270	64	43.3	29.77	17.4
10/7/99	5:45	7.6	276	62	46.5	29.78	5.4
10/7/99	6:00	8.5	268	63	43.5	29.78	2.8
10/7/99	6:15	7.3	251	64	41.9	29.79	7.8
10/7/99	6:30	6.6	252	64	41.4	29.79	2.3
10/7/99	6:45	7.6	258	63	43.0	29.79	6.0
10/7/99	7:00	5.1	283	63	42.4	29.80	12.1
10/7/99	7:15	5.8	299	63	46.3	29.81	5.0
10/7/99	7:30	6.8	320	64	46.4	29.81	13.8
10/7/99	7:45	7.6	321	67	46.0	29.82	16.8
10/7/99	8:00	4.6	308	69	44.1	29.84	25.1
10/7/99	8:15	6.4	292	71	42.5	29.85	18.2
10/7/99	8:30	5.7	319	73	41.4	29.86	10.1
10/7/99	8:45	6.5	329	75	36.4	29.88	8.5
10/7/99	9:00	8.6	333	76	33.1	29.89	7.4
10/7/99	9:15	8.4	331	77	30.2	29.90	7.4
10/7/99	9:30	11.9	335	79	26.1	29.91	8.1
10/7/99	9:45	17.3	341	80	19.0	29.92	7.0
10/7/99	10:00	15.2	341	81	18.1	29.93	8.3

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/7/99	10:15	14.3	344	81	16.4	29.93	9.6
10/7/99	10:30	13.6	333	82	16.2	29.94	9.8
10/7/99	10:45	14.0	326	82	17.0	29.94	9.7
10/7/99	11:00	12.3	346	82	15.5	29.95	10.9
10/7/99	11:15	14.0	335	83	15.4	29.95	12.3
10/7/99	11:30	15.3	335	83	15.5	29.95	8.7
10/7/99	11:45	17.4	332	83	15.0	29.95	7.7
10/7/99	12:00	14.3	338	84	14.3	29.95	11.6
10/7/99	12:15	14.7	340	85	14.6	29.95	14.7
10/7/99	12:30	12.7	341	85	14.7	29.96	10.6
10/7/99	12:45	16.0	325	84	16.6	29.95	13.4
10/7/99	13:00	13.1	318	85	16.1	29.95	16.8
10/7/99	13:15	14.2	330	85	15.3	29.94	15.3
10/7/99	13:30	16.4	323	86	15.0	29.93	8.6
10/7/99	13:45	17.1	323	86	13.7	29.93	10.8
10/7/99	14:00	16.0	333	87	12.3	29.92	14.9
10/7/99	14:15	15.3	338	87	12.6	29.92	16.1
10/7/99	14:30	14.5	322	87	13.2	29.92	11.6
10/7/99	14:45	13.3	322	87	13.2	29.92	13.4
10/7/99	15:00	14.4	318	87	13.0	29.92	9.7
10/7/99	15:15	13.5	324	87	12.8	29.92	12.3
10/7/99	15:30	13.9	316	87	12.6	29.92	7.8
10/7/99	15:45	12.5	319	87	12.7	29.92	9.5
10/7/99	16:00	12.2	310	87	12.4	29.91	10.3
10/7/99	16:15	11.8	310	87	12.1	29.91	10.2
10/7/99	16:30	11.7	320	87	12.2	29.91	10.0
10/7/99	16:45	11.8	318	87	12.1	29.91	10.5
10/7/99	17:00	11.5	312	87	13.0	29.91	8.3
10/7/99	17:15	12.1	324	86	13.4	29.90	5.4
10/7/99	17:30	10.8	317	85	14.1	29.90	7.3
10/7/99	17:45	9.1	315	85	15.1	29.90	6.5
10/7/99	18:00	8.1	313	83	17.2	29.90	5.7
10/7/99	18:15	6.0	302	81	18.9	29.90	5.6
10/7/99	18:30	5.9	284	80	19.7	29.89	5.0
10/7/99	18:45	6.7	295	79	18.8	29.89	8.4
10/7/99	19:00	8.2	314	80	17.7	29.89	4.4
10/7/99	19:15	5.3	305	79	20.0	29.88	9.9
10/7/99	19:30	3.1	253	76	22.3	29.88	25.2
10/7/99	19:45	3.9	289	75	23.1	29.88	7.7
10/7/99	20:00	4.4	248	74	24.2	29.88	12.1
10/7/99	20:15	5.4	276	76	23.6	29.88	13.0
10/7/99	20:30	6.8	289	76	24.8	29.87	3.6
10/7/99	20:45	6.6	305	76	27.2	29.87	6.9
10/7/99	21:00	5.4	300	76	28.0	29.87	10.8
10/7/99	21:15	5.9	286	75	28.9	29.87	5.7

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/7/99	21:30	6.0	302	75	28.7	29.88	6.2
10/7/99	21:45	8.6	313	75	28.0	29.88	4.1
10/7/99	22:00	6.6	309	74	29.7	29.88	4.5
10/7/99	22:15	5.0	272	71	33.9	29.88	37.9
10/7/99	22:30	6.9	243	69	36.6	29.89	10.4
10/7/99	22:45	7.7	251	71	34.7	29.89	10.7
10/7/99	23:00	7.7	276	71	34.9	29.88	6.4
10/7/99	23:15	8.0	267	69	38.9	29.88	26.8
10/7/99	23:30	7.4	247	67	37.7	29.88	21.0
10/7/99	23:45	7.6	273	70	31.1	29.88	5.9
10/7/99	24:00:00	8.1	258	69	30.6	29.88	4.4
10/8/99	0:15	7.3	264	69	29.6	29.88	3.1
10/8/99	0:30	6.4	266	68	30.4	29.87	3.2
10/8/99	0:45	6.8	265	68	29.6	29.87	4.6
10/8/99	1:00	7.1	256	68	30.0	29.87	6.4
10/8/99	1:15	6.1	255	68	30.5	29.87	11.2
10/8/99	1:30	6.9	243	67	33.6	29.88	5.3
10/8/99	1:45	6.5	250	67	32.4	29.87	5.8
10/8/99	2:00	7.1	262	68	30.0	29.87	7.1
10/8/99	2:15	6.9	273	68	28.5	29.87	4.7
10/8/99	2:30	8.3	277	67	29.8	29.87	3.8
10/8/99	2:45	6.6	270	66	33.6	29.86	16.3
10/8/99	3:00	6.5	234	65	34.6	29.86	5.0
10/8/99	3:15	7.0	258	67	30.4	29.86	6.0
10/8/99	3:30	7.7	262	68	28.3	29.86	3.5
10/8/99	3:45	7.3	273	68	26.7	29.86	3.8
10/8/99	4:00	6.5	267	68	27.0	29.86	4.1
10/8/99	4:15	6.4	273	67	27.8	29.86	4.1
10/8/99	4:30	6.2	276	68	27.3	29.86	4.3
10/8/99	4:45	5.6	282	68	28.6	29.86	2.0
10/8/99	5:00	5.2	272	66	29.9	29.86	9.4
10/8/99	5:15	4.9	266	67	28.3	29.86	3.8
10/8/99	5:30	5.6	262	67	28.6	29.86	8.1
10/8/99	5:45	7.2	248	66	30.7	29.86	7.3
10/8/99	6:00	6.5	251	66	29.0	29.87	6.3
10/8/99	6:15	5.1	259	66	28.3	29.87	5.6
10/8/99	6:30	5.0	257	66	27.3	29.87	7.0
10/8/99	6:45	6.0	239	66	29.2	29.88	6.2
10/8/99	7:00	5.8	234	66	29.2	29.88	3.9
10/8/99	7:15	5.2	264	67	26.5	29.88	10.0
10/8/99	7:30	5.8	282	69	25.0	29.89	11.9
10/8/99	7:45	5.7	280	70	22.9	29.90	7.1
10/8/99	8:00	5.0	273	71	24.0	29.91	5.7
10/8/99	8:15	5.1	285	73	23.2	29.92	7.1
10/8/99	8:30	5.7	282	75	24.1	29.93	6.2

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/8/99	8:45	6.0	277	77	25.6	29.94	6.7
10/8/99	9:00	6.5	287	77	29.4	29.95	8.4
10/8/99	9:15	4.6	299	79	31.2	29.96	9.8
10/8/99	9:30	2.9	326	81	29.1	29.97	28.5
10/8/99	9:45	4.3	349	84	22.5	29.97	13.4
10/8/99	10:00	6.0	329	84	20.9	29.98	10.7
10/8/99	10:15	4.8	330	85	19.7	29.99	15.2
10/8/99	10:30	4.1	333	88	16.4	30.00	21.7
10/8/99	10:45	3.8	3	89	13.1	29.99	32.3
10/8/99	11:00	4.5	11	90	14.0	30.00	31.8
10/8/99	11:15	6.0	25	90	13.4	30.00	27.7
10/8/99	11:30	6.1	32	90	12.3	30.00	16.1
10/8/99	11:45	5.2	53	91	12.3	30.00	30.9
10/8/99	12:00	4.4	65	91	12.2	29.99	40.6
10/8/99	12:15	3.9	23	93	11.5	29.99	41.5
10/8/99	12:30	5.2	34	93	11.2	29.98	36.4
10/8/99	12:45	5.5	5	93	11.7	29.98	33.5
10/8/99	13:00	5.1	305	93	11.7	29.97	22.4
10/8/99	13:15	4.2	269	93	11.5	29.97	44.8
10/8/99	13:30	4.6	281	95	10.9	29.96	77.8
10/8/99	13:45	5.7	355	95	10.7	29.95	31.5
10/8/99	14:00	5.3	322	95	10.3	29.94	51.5
10/8/99	14:15	5.1	302	95	10.4	29.94	31.2
10/8/99	14:30	5.9	302	95	10.4	29.93	18.9
10/8/99	14:45	6.4	318	95	10.4	29.93	30.6
10/8/99	15:00	6.3	318	95	9.5	29.93	23.8
10/8/99	15:15	6.3	302	95	9.6	29.92	25.4
10/8/99	15:30	6.7	311	96	9.5	29.92	21.9
10/8/99	15:45	4.5	308	96	9.2	29.91	30.6
10/8/99	16:00	4.9	312	96	9.3	29.91	18.2
10/8/99	16:15	5.1	302	96	9.5	29.90	16.6
10/8/99	16:30	5.6	311	96	9.6	29.90	15.5
10/8/99	16:45	6.1	277	95	9.9	29.90	17.8
10/8/99	17:00	5.4	272	95	9.8	29.90	22.1
10/8/99	17:15	5.3	295	95	9.9	29.89	11.9
10/8/99	17:30	6.8	279	94	10.3	29.89	8.3
10/8/99	17:45	7.6	266	93	12.3	29.89	8.6
10/8/99	18:00	8.6	256	92	14.0	29.89	3.7
10/8/99	18:15	6.9	252	90	15.8	29.89	3.8
10/8/99	18:30	6.9	254	87	19.2	29.89	2.5
10/8/99	18:45	7.1	256	86	19.2	29.88	2.3
10/8/99	19:00	6.6	264	86	19.8	29.88	2.7
10/8/99	19:15	6.5	268	85	19.7	29.88	1.8
10/8/99	19:30	5.8	268	84	19.2	29.87	3.1
10/8/99	19:45	5.5	272	83	20.1	29.87	3.3

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/8/99	20:00	5.8	267	82	20.4	29.87	3.7
10/8/99	20:15	5.3	267	82	20.1	29.86	2.9
10/8/99	20:30	5.4	264	82	20.6	29.86	4.1
10/8/99	20:45	5.4	264	82	20.7	29.86	1.9
10/8/99	21:00	4.7	306	80	22.9	29.86	41.1
10/8/99	21:15	5.7	8	79	27.7	29.86	10.7
10/8/99	21:30	5.0	18	79	27.6	29.86	2.9
10/8/99	21:45	4.2	17	78	26.6	29.85	5.3
10/8/99	22:00	4.5	351	79	25.8	29.85	7.0
10/8/99	22:15	4.7	335	78	25.9	29.85	4.9
10/8/99	22:30	5.6	331	80	22.9	29.85	2.5
10/8/99	22:45	6.9	332	79	23.3	29.85	2.7
10/8/99	23:00	7.3	323	79	21.0	29.85	5.0
10/8/99	23:15	6.8	302	79	20.8	29.84	8.5
10/8/99	23:30	6.4	288	78	21.7	29.84	3.8
10/8/99	23:45	7.4	276	78	20.3	29.84	3.2
10/8/99	24:00:00	8.8	279	77	19.1	29.83	3.5
10/9/99	0:15	8.4	282	76	20.9	29.83	2.5
10/9/99	0:30	8.2	286	75	22.0	29.83	2.8
10/9/99	0:45	7.6	288	74	22.5	29.83	1.0
10/9/99	1:00	7.5	288	74	23.3	29.83	2.0
10/9/99	1:15	7.3	279	73	23.9	29.83	2.8
10/9/99	1:30	7.0	276	73	22.0	29.84	2.5
10/9/99	1:45	6.8	283	74	20.5	29.84	2.8
10/9/99	2:00	7.5	282	74	19.5	29.83	1.7
10/9/99	2:15	7.3	282	75	18.2	29.83	1.2
10/9/99	2:30	6.7	286	74	19.7	29.83	3.3
10/9/99	2:45	6.2	285	72	22.5	29.83	1.4
10/9/99	3:00	6.3	284	72	21.9	29.82	1.4
10/9/99	3:15	7.2	282	72	21.5	29.82	2.6
10/9/99	3:30	6.8	278	72	22.1	29.82	1.4
10/9/99	3:45	5.5	272	71	22.3	29.82	2.7
10/9/99	4:00	6.2	270	70	23.0	29.82	1.6
10/9/99	4:15	6.5	261	70	24.0	29.82	1.1
10/9/99	4:30	6.8	260	70	24.2	29.82	1.0
10/9/99	4:45	7.5	268	70	23.4	29.82	3.0
10/9/99	5:00	5.8	266	71	22.8	29.82	2.6
10/9/99	5:15	5.7	268	70	25.5	29.82	1.9
10/9/99	5:30	5.4	268	70	25.2	29.83	4.9
10/9/99	5:45	5.6	267	69	26.9	29.83	4.0
10/9/99	6:00	5.3	274	69	26.9	29.83	3.4
10/9/99	6:15	5.2	279	69	26.5	29.83	2.9
10/9/99	6:30	4.2	271	68	28.5	29.83	6.1
10/9/99	6:45	3.1	252	67	32.9	29.83	3.5
10/9/99	7:00	3.3	245	67	32.6	29.83	10.2

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/9/99	7:15	1.9	237	67	33.5	29.84	20.7
10/9/99	7:30	1.7	250	68	31.7	29.84	13.5
10/9/99	7:45	1.8	206	69	34.5	29.85	19.0
10/9/99	8:00	1.1	274	72	29.4	29.86	51.8
10/9/99	8:15	2.4	307	75	23.8	29.87	14.7
10/9/99	8:30	4.6	298	76	25.5	29.88	9.5
10/9/99	8:45	4.2	311	77	27.3	29.89	7.8
10/9/99	9:00	4.2	305	79	26.4	29.90	10.0
10/9/99	9:15	4.7	307	81	25.6	29.91	8.4
10/9/99	9:30	6.7	318	83	18.1	29.92	7.8
10/9/99	9:45	7.4	314	84	15.0	29.93	6.6
10/9/99	10:00	6.1	332	85	17.0	29.93	11.8
10/9/99	10:15	5.7	337	86	17.2	29.94	11.5
10/9/99	10:30	5.5	325	87	18.6	29.94	12.2
10/9/99	10:45	5.2	325	88	18.7	29.95	14.9
10/9/99	11:00	5.3	318	90	17.0	29.95	18.8
10/9/99	11:15	5.3	310	91	16.1	29.95	14.5
10/9/99	11:30	4.2	320	92	13.1	29.95	19.4
10/9/99	11:45	3.7	313	94	10.8	29.95	31.3
10/9/99	12:00	2.3	61	97	9.0	29.94	79.9
10/9/99	12:15	3.9	11	96	7.9	29.94	30.4
10/9/99	12:30	4.1	3	97	8.4	29.94	40.8
10/9/99	12:45	4.8	352	97	9.0	29.94	33.2
10/9/99	13:00	4.4	19	97	8.5	29.93	29.2
10/9/99	13:15	4.8	336	98	8.9	29.93	60.1
10/9/99	13:30	5.6	299	97	9.0	29.92	17.2
10/9/99	13:45	5.5	310	98	8.9	29.92	28.0
10/9/99	14:00	4.4	323	99	7.8	29.91	50.2
10/9/99	14:15	4.1	318	99	7.6	29.90	49.9
10/9/99	14:30	3.4	339	101	7.0	29.90	59.2
10/9/99	14:45	3.8	311	101	7.1	29.90	37.6
10/9/99	15:00	4.7	306	100	7.5	29.89	26.1
10/9/99	15:15	4.8	314	100	7.6	29.89	22.3
10/9/99	15:30	2.8	319	101	7.1	29.89	61.3
10/9/99	15:45	4.8	312	100	7.7	29.89	21.4
10/9/99	16:00	3.4	318	100	7.0	29.89	64.3
10/9/99	16:15	5.6	306	100	7.6	29.88	13.7
10/9/99	16:30	5.5	292	99	7.6	29.88	10.7
10/9/99	16:45	5.9	283	99	7.9	29.88	13.1
10/9/99	17:00	6.2	292	99	8.0	29.88	10.2
10/9/99	17:15	6.1	290	98	8.4	29.87	6.6
10/9/99	17:30	5.2	286	98	8.2	29.87	6.8
10/9/99	17:45	4.9	277	98	8.2	29.87	6.9
10/9/99	18:00	3.7	274	96	10.1	29.87	9.7
10/9/99	18:15	4.1	265	94	11.7	29.87	2.5

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/9/99	18:30	4.5	269	93	12.6	29.87	4.2
10/9/99	18:45	4.7	270	91	13.2	29.87	4.7
10/9/99	19:00	5.0	274	90	13.8	29.87	4.8
10/9/99	19:15	6.0	279	90	15.5	29.86	2.1
10/9/99	19:30	5.8	286	89	15.4	29.86	2.7
10/9/99	19:45	5.6	285	89	15.3	29.86	2.7
10/9/99	20:00	5.0	294	88	16.7	29.85	3.2
10/9/99	20:15	4.5	301	87	17.3	29.85	18.3
10/9/99	20:30	5.0	9	84	24.4	29.85	7.1
10/9/99	20:45	3.9	17	82	24.6	29.85	6.4
10/9/99	21:00	4.3	5	84	20.9	29.85	4.6
10/9/99	21:15	4.3	9	84	20.8	29.85	2.8
10/9/99	21:30	4.4	9	84	19.8	29.85	5.1
10/9/99	21:45	3.8	16	83	19.6	29.84	2.1
10/9/99	22:00	4.0	20	83	19.0	29.84	1.3
10/9/99	22:15	4.1	25	83	18.1	29.84	2.5
10/9/99	22:30	3.4	30	83	18.7	29.84	5.1
10/9/99	22:45	3.9	342	80	25.5	29.84	75.7
10/9/99	23:00	7.0	244	76	30.2	29.84	2.9
10/9/99	23:15	6.7	246	77	30.3	29.84	2.1
10/9/99	23:30	6.5	249	78	26.6	29.84	5.0
10/9/99	23:45	5.5	262	81	20.9	29.83	3.3
10/9/99	24:00:00	5.5	255	80	22.5	29.83	2.3
10/10/99	0:15	5.9	254	78	25.3	29.83	3.9
10/10/99	0:30	5.7	256	76	26.2	29.83	1.1
10/10/99	0:45	5.7	254	76	25.6	29.83	3.7
10/10/99	1:00	7.3	280	78	18.8	29.83	8.7
10/10/99	1:15	6.8	267	79	18.4	29.83	7.4
10/10/99	1:30	6.6	247	76	22.2	29.83	3.2
10/10/99	1:45	6.1	252	75	22.7	29.83	3.0
10/10/99	2:00	5.8	261	74	24.3	29.82	5.3
10/10/99	2:15	6.8	268	74	22.2	29.82	2.5
10/10/99	2:30	6.5	264	74	21.9	29.82	2.3
10/10/99	2:45	5.8	269	74	21.9	29.82	6.5
10/10/99	3:00	6.5	283	73	22.1	29.82	4.5
10/10/99	3:15	7.0	297	73	23.1	29.82	2.9
10/10/99	3:30	7.7	302	74	21.9	29.81	4.5
10/10/99	3:45	6.1	313	73	22.8	29.81	4.8
10/10/99	4:00	4.7	326	72	28.1	29.82	7.4
10/10/99	4:15	3.9	313	70	29.8	29.82	9.9
10/10/99	4:30	3.4	312	70	28.1	29.82	6.2
10/10/99	4:45	3.0	311	70	28.6	29.82	10.7
10/10/99	5:00	2.9	290	70	26.4	29.82	7.1
10/10/99	5:15	4.5	278	70	26.0	29.82	6.6
10/10/99	5:30	5.4	280	72	23.8	29.82	5.9

CYCLOATE APPLICATION METEOROLOGICAL DATA

Export Filename : C:\MICROMET\CYCL15\EXPORT\99100510.TXT
Export data for station : Cycloate Applica
Printing Date : 1999/11/10

		WS	WD	AT	RH	BP	Sigma
		(mph)	(Deg)	(Deg F)	(%)	(inHg)	(Deg)
10/10/99	5:45	7.0	253	70	28.0	29.82	6.1
10/10/99	6:00	7.2	247	68	29.8	29.82	3.3
10/10/99	6:15	6.9	249	68	28.6	29.83	3.0
10/10/99	6:30	5.4	248	68	29.6	29.83	3.6
10/10/99	6:45	4.9	260	68	28.1	29.83	3.0
10/10/99	7:00	4.3	266	70	26.1	29.83	2.4
10/10/99	7:15	3.9	259	70	25.1	29.83	2.5
10/10/99	7:30	4.3	257	71	23.8	29.84	2.6
10/10/99	7:45	4.3	253	71	25.6	29.85	3.3
10/10/99	8:00	4.0	280	73	23.3	29.86	7.8